DOCTOR OF PHILOSOPHY

Continued Bonds

Towards the Design of Computationally Creative Bereavement Support

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Continued Bonds: Towards the Design of Computationally Creative Bereavement Support

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Dedication Page

Dedicated to my late mother, and presently existing father

Margaret Cheatley

&

Edward Cheatley

Declarations

Candidate's Declaration

I, Lee Cheatley, hereby declare that I am the author of this thesis; that I have consulted all references cited; that I have done all the work recorded by this thesis; and that it has not been previously accepted for a degree.

Supervisor's Declaration

I, Wendy Moncur, hereby declare that I am the supervisor of the candidate, and that the conditions of the relevant Ordinance and Regulations have been fulfilled.

Publications

Peer-reviewed publications related to this thesis

Cheatley, L., Ackerman, M., Pease, A., Moncur, W. 2020. Co-Creative Songwriting for Bereavement Support. 11th International Conference on Computational Creativity, Coimbra, Portugal

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Abstract

This doctoral thesis investigates the ways developers can create technology to support bereaved people express themselves and engage with their bereavement experience. This research project, through four empirical studies, has generated insights into what bereaved users would want or expect from such a system, and what experts would expect of it. These insights have been used to develop a series of design goals and objectives for developers of bereavement support technology. Foremost amongst these goals are that technology to support the bereaved should support self-expression and promote wellbeing. Design objectives intended to meet these goals have been tested with end users interacting with pre-existing technology that meets many of the objectives. These user tests show computational creativity (CC) systems can help people express themselves and how they are feeling, process their feelings, and continue bonds with the deceased, amongst other things. The results of the final study suggest that the use of computationally creative bereavement support tools can improve the wellbeing of its users, and that CC systems are more helpful for younger users.

Glossary of Abbreviations and Terms

Abbr.	Term	Description
	Arts Based Interventions	Arts Based Interventions, for the purposes of this thesis, refer to formal interventions that use art to facilitate expression. These can include painting, poetry, song writing, singing, and more.
	Bereavement	The situation of a person who has experienced the death of someone.
	Bereavement Experience	The bereaved individual's response to grief, how and whether they cope with the grief. E.g. oscillation between focussing on loss and avoiding it, or the continuation of bonds between bereaved and deceased.
CC	Computational Creativity	Computational Creativity is the *"The philosophy, science and engineering of computational systems which, by taking on particular responsibilities, exhibit behaviours that unbiased observers would deem to be creative"* [10, p1]
	Digital Possession	People create and curate large troves of digital material that include user accounts, and digital media such as photographs, videos and messages. These materials, herein, are referred to as *"digital possessions"* due to their role in the creation and maintenance of identity [72,122]
	Formal Interventions	Formal Interventions refer to support provided to bereaved individuals in a professional or formal setting by a trained expert (professional or volunteer).
	Freemium	Freemium is a portmanteau of the words free and premium. Freemium is often used to describe smartphone applications or digital services that offer free services with reduced functionalities and a premium (paid) service that offers full functionalities.
	Grief	The emotional experience bereaved individuals may face as a result of bereavement.

HCI	Human-Computer Interaction	Human-Computer Interaction is an academic field that explores how people interact with computers, and how technology can be designed to facilitate interaction.
RfD	Research for Design	Research for Design is a term that refers to research conducted to inform the design of potential systems.
RtD	Research through Design	Research through Design is a term that refers to research that involves the creation and/or evaluation of a system or prototype to test hypotheses.
TA	Thematic Analysis	An iterative process through which patterns (themes) in qualitative data are identified.
	Traditional Interventions	Traditional Interventions, for the purposes of this thesis, refer to formal interventions that use speech as the main or only form of communication.
UCD	User-Centred Design	*"User-centered design (UCD) is an iterative design process in which designers and other stakeholders focus on the users and their needs in each phase of the design process. UCD calls for involving users throughout the design process via a variety of research and design techniques so as to create highly usable and accessible products for them."*[116]
UXD	User-Experience Design	*"User experience [UX] refers to the singular and accumulated experiences that occur for users as a consequence of them interacting with an object in a given context."* [5] UX Design considers these experiences in the design of technology.
WEMWBS	Warwick-Edinburgh Mental Wellbeing Scale	Validated scale designed to evaluate the mental wellbeing of people aged 16 and over.

Chapter 1

1 Introduction

The loss, through death, of a loved one is a ubiquitous human experience, and coming to terms with this loss is seen as a sign of successful adult development [7], and fundamental to people's mental and physical wellbeing [177]. A 2018 survey conducted by hospice UK and Sue Ryder palliative neurological and bereavement support estimated the number of people bereaved in Scotland annually was over 230,000 [146]. While bereavement may be a universal phenomenon, the reactions to it are not, and can be influenced by the relationship between the bereaved and deceased, the time elapsed since death, and the circumstances of death [20], amongst other factors [for more, see 5]. It is generally accepted that individuals, to successfully come to terms with their loss, should (1) accept the reality of their loss, (2) experience and endure the pain brought about by loss, (3) adjust to a world without the deceased, and (4) continue bonds with the deceased whilst they continue to live their life [151,177]. However, people can find these difficult to do, and as a result seek additional support.

Typically, people believe they should seek formal interventions to help with the grief associated with bereavement. These formal interventions are offered by trained professionals or volunteers, and often use person-centred therapy. These interventions seek to help the bereaved express themselves and provide relevant information to normalise their bereavement experience. These formal interventions are most often verbal-based therapy in which the bereaved client discusses their experience [6,115], but also include arts therapies which seek to enable those less comfortable or able to express themselves verbally to express themselves in other ways [56,89,99,110]. Despite the prevalence of more verbal-based interventions, they are often less effective than the people providing them believe them to be [74]. This can be because formal interventions are often unnecessary, provided in an untimely manner and in

insufficient numbers, and that the intervention does not provide the support required [74]. A recent survey conducted in Scotland [146] showed that despite only 6% of respondents accessing bereavement support, 23% of respondents wanted support but couldn't access it: 12% didn't know how to access it; 8% felt uncomfortable asking for support; and 3% couldn't find the type of support they wanted. This report goes on to cite related literature, and argues 10-20% of those who experience bereavement will experience 'prolonged grief' - a more debilitating grief that the bereaved cannot easily overcome - and that those who experience prolonged grief are less likely to seek help. Additionally, despite arts therapies having been shown to successfully support bereaved people to express themselves, gain new insight, make sense of their loss, and continue bonds with those they have lost, the facilitator often has to offer a series of sessions over a period of time to ensure the client is comfortable expressing themselves [56,89,99,110].

In recent years, people are increasingly turning to technology for support in their bereavement. Websites have sprung up that allow users to create memorial pages for those they have lost [18,62], light digital candles to commemorate them [144], send communications to the deceased [25], and facilitate communication with other bereaved people [41,47]. Pre-existing services, such as Facebook, are likewise implementing internal changes to support memorialisation and facilitate communication between bereaved individuals through Facebook groups [18]. Despite this, the use of these services, which usually promote or allow interactions with other users, can put the bereaved in contact with trolls (malicious users) who can cause upset or distress [55,137]. Other research in the field of HCI has explored the creation of novel technologies to support the bereaved to carry out actions associated with bereavement, such as reminiscence. These technologies usually come in the form of a physical container that contains digital possessions similar to digital photo frames, such as Story Shell [106] and Fenestra [167]. These novel technologies have, largely, been well received by the bereaved but make little use of technology at its current level of advancement.

To date there has been little work that investigates how more advanced technologies could be designed and deployed to support bereaved people with their grief. Individuals, and industry have begun to explore the use of artificial intelligence and holograms to mimic the deceased, but little research has been conducted to explore

whether this is something people want [22,23]. Similarly, researchers in the field of Computational Creativity (CC) – *"The philosophy, science and engineering of computational systems which, by taking on particular responsibilities, exhibit behaviours that unbiased observers would deem to be creative"* [10, p1] - have not fully explored the potential applications for the systems they create. CC researchers have focussed more on the creation of systems that are able to generate output that would be considered creative if a human was believed to have produced it, such as poetry and music [2,30,100].

Bereaved people can struggle to adapt to and engage with their bereavement and grief. The bereaved often lack support they can engage with to help with their bereavement experience, which can be a result of support being unavailable, unaffordable, uncomfortable, or unhelpful. People are increasingly turning to technology for help, but few technological options used by people in the aftermath of bereavement have been designed with the bereaved specifically in mind. These technological sources of help are often simple websites or pages and do not make use of technology to its fullest. This research thesis explores how we can utilise CC technology to support those who have been bereaved of someone they love to express themselves and engagement with their bereavement experience. To do this, we:

1. Examine currently prevalent bereavement theories, formal interventions available to bereaved people, CC research, digital possessions and ownership, current technological options, and those proposed by researchers (see Chapter 2).

2. Elicit user requirements for CC bereavement technology and explore receptiveness to its use (see Chapter 4).

3. Explore how the use of CC can lead to the creation of more meaningful possessions through the pursuit of psychological ownership (see Chapter 5).

4. Investigate the help offered to bereaved people by experts (counsellors, therapists, etc) and have them evaluate provisional design recommendations for a CC bereavement support tool (see Chapter 6).

5. User test a CC system that employs most of the recommendations formulated, and explore whether they felt it was beneficial, and in what ways. As such, the

work undertaken as part of this thesis explores the intersections between psychology, HCI, and CC, and identifies what should be considered when designing CC technology to support the bereaved, and how these considerations can be implemented (see Chapter 7)

This research thesis explores how we can utilise CC in technology to support those who have experienced the loss of a loved one to engage with their bereavement experience. To do this, the thesis explores the intersections between psychology, Human Computer Interaction (HCI), and Computational Creativity (CC) research, and investigates what bereaved people and experts expect from technology that uses CC to support the bereaved.

1.1 Problem

The chief problem to be addressed in this thesis is that: bereaved people often lack support they can engage with for therapeutic value. This includes instances where support is unavailable, unaffordable, uncomfortable, or not helpful. A secondary problem to be addressed is that: CC researchers, largely, have not explored the potential therapeutic benefits of the systems they create, and HCI researchers, largely, have not explored the use of Computational Creativity to support the bereaved.

1.2 Motivation

Bereavement is an issue humanity will always be faced with, and the grief experienced as a result will not always be easy to come to terms with. This thesis explores new ways to provide support to those who have experienced bereavement. As formal interventions often experience problems related to availability, cost, and the willingness of participants to attend and engage, this thesis examines alternative avenues of support for the bereaved. People are increasingly turning to online services for bereavement support, and with the prevalence of technology and smart devices in daily life, we believe that the provision of online support for the bereaved is appropriate. In such a sensitive context as bereavement, opportunities exist to inform designers of factors to consider when designing technology to support the bereaved. We hope that the provision of this information to designers will enable the creation of

more supportive technology, that better enables those who have experienced bereavement to express themselves and engage with their bereavement experience.

1.3 Research Objectives

The central goal of this thesis is to showcase the potential for CC systems to support bereaved people, and to provide insight into how developers can create CC systems that support bereaved people express themselves and process their bereavement experience. As such, the following two-part question served as the overarching question to be answered:

> *"Can CC systems help users undertake actions associated with successful adaption to bereavement and grief? If so, how do we design systems to achieve this?"*

In order to achieve this goal, we answered the following research questions:

> *RQ1: How can CC systems be designed to facilitate current reminiscence practices of the bereaved?*
>
> *RQ2: How can CC systems facilitate the creation of more meaningful digital possessions – digital media such as text files, or music?*
>
> *RQ3: How can CC systems be designed to reflect the approach taken in formal interventions to support the bereaved?*
>
> *RQ4: In what ways do users find CC systems helpful in engaging with their bereavement experience?*

1.4 Solution

To address problems of availability and willingness to engage with bereavement support faced by formal bereavement interventions we have identified and presented design goals and objectives for the development of computationally creative bereavement support tools that help bereaved people who do not require formal interventions, and that could supplement formal interventions. These goals and objectives have been tested with bereaved individuals and show promise, facilitating

the creation of meaningful digital possessions, and helping people express and process their bereavement experience.

1.5 Steps Towards Solution

Five major tasks were undertaken to identify and develop goals and objectives for those who may choose to develop systems to support the bereaved (see Figure 1 below):

1. A literature review was conducted that identified relevant bereavement theories and interventions, surveyed research into technology for the bereaved, and identified computational creativity's potential to supplement these technologies.
2. A series of semi-structured interviews were conducted, with 13 bereaved participants, to explore their reminiscence practices and to identify provisional design recommendations for technology designed to support the bereaved.
3. An online survey, with 35 bereaved participants, was conducted to test four of the provisional design recommendations through user testing of an already existent system.
4. A series of semi-structured interviews were conducted, with 7 mental health care practitioners, that explored how they support the bereaved, and had them evaluate the design recommendations and make suggestions.
5. An evaluative research study was undertaken, with 7 bereaved participants, to explore participant receptiveness to a computationally creative system in a bereavement context, the therapeutic value of the system for participants, and in general to further test the design recommendations.

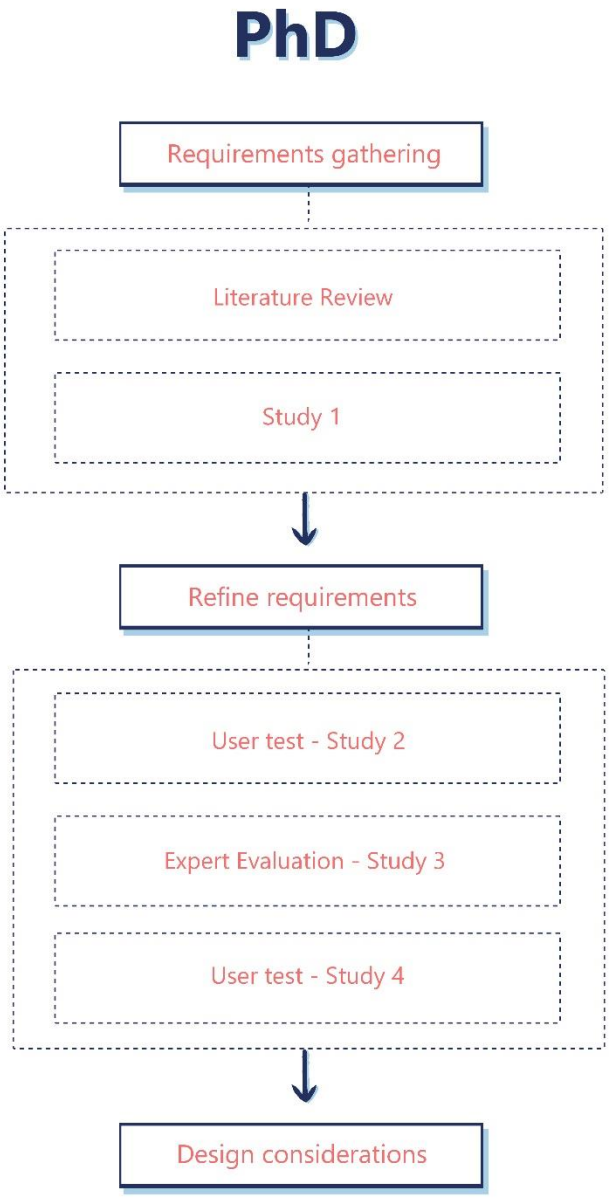


Figure 1: PhD Flow

1.6 Contributions

The main contribution of this thesis is a series of design goals and objectives for the development of computationally creative bereavement support tools that support the bereaved to express themselves and engage with their bereavement experience. The goals and objectives provide guidance on what a system designed to support the bereaved should do and how this can be achieved. A secondary contribution of this thesis is showcasing, to HCI and CC researchers, the potential for CC to be used to support bereaved people.

1.7 Thesis Structure

This thesis reports on the work described within this introductory chapter and is presented in the following eight chapters:

Chapter 1 – Introduction: Provides a background to the research, and presents the problem, motivation, research objectives, solution, steps taken towards the solution, contributions of the thesis, and the overview of the thesis structure you are reading now.

Chapter 2 – Related Works: Outlines the background work related to this topic, chiefly an introduction to bereavement and grief. The chapter then goes on to present more related research in HCI, Psychology, and CC around bereavement interventions, bereavement technology, physical and digital possessions, ownership, and computational creativity. The chapter ends with a discussion of the research gap identified.

Chapter 3 – Methodology: Details the methods and methodologies employed in the research conducted and reported in this thesis. This will include user centred design, research for and through design, research in sensitive contexts, and data gathering (semi-structured interviews, online survey, evaluative research/user testing), and analysis (thematic analysis, and statistical analysis) methods used.

Chapter 4 – Study 1: Reminiscence practices amongst bereaved individuals. Presents exploratory research aimed at investigating current reminiscence practices, and receptiveness to CC systems to support the bereaved. This information presented in this chapter will include information on the: study setup (procedure, participants, and analysis); results; discussion; conclusion – Describes the motivation, method, and findings of the study.

Chapter 5 – Study 2: Ownership and Digital Possessions. Presents research conducted to explore and validate a series of design considerations for CC technology to create more meaningful digital possessions. The information presented in this chapter will include information on the: study setup (procedure, participants, and analysis); results; discussion; conclusion – Describes the motivation, method, and findings of the study.

Chapter 6 – Study 3: Expert Interviews and Design Opportunity Evaluation. Presents exploratory research conducted to gain insights into the support provided to bereaved people by experts, and to have the design considerations evaluated by experts. The information presented in this chapter will include information on the: study setup (procedure, participants, and analysis); results; discussion; conclusion – Describes the motivation, method, and findings of the study.

Chapter 7 – Study 4: User experience of a CC system in a bereavement context. Presents research conducted to further explore and validate the identified and refined design considerations, with an emphasis on whether the system helped participants engage with activities associated with bereavement, and whether it improved their wellbeing. The chapter will provide information on the: study setup (procedure, participants, and analysis); results; discussion; conclusion – Describes the motivation, method, and findings of the study.

Chapter 8 – Discussion. Presents the design goals and objectives for CC systems intended to support bereaved people and reflects on the research and contributions. The information presented in this chapter will include a summary of the research conducted; the key findings; and the challenges and limitations.

Chapter 9 – Conclusion: Summarises the thesis and contributions, discusses avenues for future work, and presents final remarks.

Chapter 2

2 Background and Related Work

2.1 Chapter Summary

This chapter presents a review of literature relevant to understanding grief and bereavement, and the technology that can be harnessed to support people who experience it. Due to the interdisciplinary nature of designing technology to support the bereaved, the literature to be reviewed will be diverse. We draw on research from the fields of psychology, CC, and HCI to provide an overview of current insights and gaps in our understanding of what should be considered when developing technology to support bereaved people. This research is presented in five sections: (1) Bereavement and Grief; (2) Formal Interventions; (3) Computational Creativity; (4) Digital Possessions and Ownership; and, (5) Technology to Support the Bereaved. Bereavement and Grief presents an overview of what bereavement and grief are, the types of grief one may experience, and the current prevailing theories on how people engage with bereavement. Formal Interventions provides an overview of the formal or professional support available to bereaved people, including traditional or speech-based interventions and arts-based interventions. Computational Creativity provides an overview of the field and showcases example systems. Digital Possessions and Ownership introduces possessions and goes on to discuss digital possessions, ownership, and meaningful possessions. Technology to Support the Bereaved presents HCI work exploring the theoretical design of systems to support the bereaved, and the creation and implementation of such systems. Finally, opportunities not yet seized, and challenges faced by formal interventions and technology for the bereaved will be summarised and synthesised to highlight how bringing together these disparate fields can help inform the design of computationally creative bereavement support tools.

2.2 Bereavement and Grief

Christopher Hall, the director for the Australian Centre for Grief and Bereavement remarked:

> *"...grief is the price we pay for love, and a natural consequence of forming emotional bonds to people, projects, and possessions. All that we value we will someday lose. Life's most grievous losses disconnect us from our sense of who we are and can set in train an effortful process of not only re-learning ourselves but also the world." [66, p.7]*

Herein, we look at grief in a bereavement context. Death, and loss are ubiquitous human experiences. We are encouraged to socialise and make friends, to form social relationships throughout our lives, and in today's world with the help of technology, we do so at an ever-increasing rate. When these relationships are physically severed by someone's death, we often experience grief. Grief refers to *"the emotional experience of the psychological, behavioural, social, and physical reactions the bereaved person might experience as a result of"* bereavement [14, p.1]: which can be defined as the *"objective situation of a person who has experienced the death of someone significant."* [14, p.1]. The reactions of a bereaved person to loss are individual and diverse. Some may experience little to no emotional reaction (*"uncomplicated grief"*), others may experience an extreme emotional reaction to grief (*"complicated grief"*) [177]. Just as people can experience bereavement multiple times, the longevity and intensity of the grief can differ from bereavement to bereavement and can differ between people who have lost the same person. The nature of grief experienced as a result of bereavement is influenced by several factors, including the bereaved individual's spiritual or cultural beliefs, the support and resources they have available, their relation to the deceased (e.g. parent, sibling, friend), their relationship with the bereaved (e.g. close, ambivalent, distant, loving), and the type of loss (e.g. expected, gradual, sudden, suicide, homicide) [180].

Bereavement and grief have been the inspiration behind many great works, be they physical such as Egypt's pyramids or the totem poles of the Northwest American coast, or intangible such as Deep Purple's song Above and Beyond. Despite this,

bereavement can have adverse effects on the bereaved individual's physical health. The day immediately following bereavement, the bereaved is 21 times more likely to suffer a heart attack, and in the following 6 days, 6 times more likely to [111]. In the weeks and months to follow, those experiencing grief remain more likely to suffer heart attacks and strokes [21], increased blood pressure and clotting [19], and a decrease in weight [155]. In the elderly, grief can leave the bereaved more vulnerable to infectious disease [169], and less able to prevent it, with the flu vaccination being less effective [138]. It also aggravates physical pain [16], and in elderly widows and widowers can lead to developing or worsening illnesses, an increase in usage of medication, and poorer health ratings [166]. Failure to adapt to bereavement and engage with its resultant grief can lead to an increased risk of mortality, and greater detrimental effects on physical and mental health.

2.2.1 Uncomplicated Grief

Due to the differences in the grief experienced by bereaved people, uncomplicated grief can be difficult to define. Zisook and Shear [180] urged caution for those that sought to define or diagnose it. They, instead, describe grief without complications, and emphasise the variability of the experience. Zisook and Shear describe grief as *"one of the most gut-wrenching and painful experiences an individual ever faces"* [180, p.68]. Additionally, they describe those who are able to weather the impact of this and come to terms with their grief with minimal help and within certain timeframes as people who have experienced uncomplicated grief. Those who experience uncomplicated grief learn to adapt to the loss they have experienced, and in time to incorporate it into their lives and are no longer preoccupied by it [157].

In the immediate aftermath of bereavement, the bereaved individual's grief can feel overwhelming, and lead to them exhibiting behaviours they would not ordinarily, such as sadness, crying, disinterest in other people or activities, or a preoccupation with the loss. Zisook and Shear define this as *acute grief* [180]. Acute grief can disrupt the bereaved individual's daily life, and negatively impact their social or work lives. In addition, experiencing positive emotions such as happiness, joy, and relief can lead to feelings of guilt. These negative feelings can make the bereaved unwilling to interact with their grief, which can inhibit their progression.

Zisook and Shear note the experience of positive feelings (not resulting in guilt) after 6 months of bereavement is a promising indicator of likely adaption to bereavement [180]. For those who experience uncomplicated grief, it is likely that within months of bereavement they are able to adapt to bereavement and begin to live uninterrupted by grief, although they may still experience triggers, such as anniversaries or birthdays, that can temporarily intensify their grief again. This is known as *integrated grief* [180]. In line with this, uncomplicated grief herein refers to grief that the bereaved individual is able to adapt to without the help of formal interventions.

2.2.2 Complicated Grief

The grief experienced as a result of bereavement is not always uncomplicated. It is estimated that somewhere between 7-10% of bereaved people experience *complicated grief* [157,180]. Complicated grief is the inability to transition from acute to integrated grief [180], or the inability to adapt to bereavement and assimilate feelings of grief into everyday life. Complicated grief has been compared to a physical wound:

> *"Think about a physical wound that produces an inflammatory response as part of the healing process. A wound complication, for example an infection, increases the inflammation and delays healing. You can think of bereavement as analogous to an injury, and grief as analogous to the painful inflammatory response, and complicated grief as analogous to a superimposed infection. The result is delayed healing and increased pain which occurs because aspects of a person's response to the circumstances or consequences of the death derail the mourning process, interfering with learning, and preventing the natural healing process from progressing." [101, p122]*

Those who experience complicated grief may continue to experience the intense and overwhelming feelings common to acute grief [157,180]. These feelings may be continuous, long lasting, and debilitating. Symptoms which would normally dissipate over time for those experiencing uncomplicated grief will also persist in cases of complicated grief. These can include, but are not limited to: intense sorrow, pain and rumination over the loss; focus on or avoidance of reminders of the deceased; bitterness; numbness or detachment; a sense of purposelessness or futility; and in

extreme cases suicidal ideation [158]. Those that experience complicated grief may: struggle to carry out normal routines; isolate themselves from others; experience depression, deep sadness, guilt or even self-blame; believe they could have prevented the death; feel life isn't worth living without the deceased; and wish they had died alongside the deceased [158]. The intensity and longevity of complicated grief and its symptoms make it extremely difficult for the bereaved to participate in the grieving process and ultimately to adapt to their bereavement.

2.3 Bereavement Theories

The field of Grief and Bereavement has undergone considerable change during its relatively short existence, almost unrecognisable now from what once was proposed by its earliest pioneers. As theory has continued to advance, so too has our understanding of the human mind and brain. Possibly the most drastic changes are in relation to bereavement, how it is understood, and how the bereaved adapts to it and engages with their grief. Lack of supporting evidence has led to early theories espoused by Freud [52] and Kübler-Ross [85], of a navigable, predictable trajectory from distress to recovery, and the notion of letting go and discarding the deceased, being rejected[177]. These have been rejected in favour of models that, by and large, accept that some may never experience grief, some may never overcome it, and that for some a continuation of bonds with the deceased helps, as can oscillation between focussing on and avoiding the bereavement [66,82,177].

2.3.1 Stages, Phases, and Tasks

The first major work on grief, and the one that encouraged and inspired a generation to pursue grief work was Freud's seminal paper Mourning and melancholia [52]. This came to shape the study of grief for decades. "*Grief work"* consisted of breaking the ties between deceased and bereaved. The process through which this was done involved three core elements or tasks: (1) freeing the bereaved from the bondage to the deceased; (2) readjustment to new life circumstances without the deceased; and (3) building of new relationships. Freud argued that the bereaved must acknowledge and express any negative, or painful emotions felt, such as anger and/or guilt. Freud argued if the bereaved avoided engaging with these emotions and failed to undertake the tasks that the process would be complicated and the bereaved increased their risk of mental

and physical illness, which would further endanger their recovery. His grief work emphasised the importance of *"moving on"* as quickly as possible in order to return to what he termed as normal levels of functioning. Despite this, and contrary to his own theories of grief, Freud continued to write about and to his daughter 30 years after her death. In his personal life, it would seem Freud was cognisant of the long-term nature of grief, and the benefits of continued bonds and the expression of feelings [156].

For decades Freud's work was built upon and used to generate theories of stages, phases and tasks, associated with grief [15,85,130]. The most prominent, arguably, amongst these, was the work and theories of Kubler-Ross. Inspired by Freud's works, and informed by her experience working in a clinic with the dying, Kubler-Ross theorised a model of *anticipatory grief*, which over time evolved into what is possibly the most popular and well-known model of grief - the 5 stages of grief. In which the person deals with: (1) shock and denial; (2) anger, resentment and guilt; (3) bargaining; (4) depression; and (5) acceptance. This model was applied not only to grief and the bereavement process but also other forms of change. Much like Freud's work, her model suggested that failure to complete stages would result in complications and whilst it has become a widely known model (see Figure 2), it has, largely, been dismissed due to a lack of empirical grounding [163].

Figure 2: 5 Stages of Grief

Theories of grief and the mourning process have evolved to be task-based. One of the most widely accepted of these is Worden's Four Tasks of Mourning model which is

comprised of four tasks that those experiencing grief may or may not undertake, and may revisit [177]. These are summarised below, and the process illustrated (Figure 3):

1. Accepting their loss
2. Enduring or processing the pain brought about by grief
3. Adjusting to a world without the deceased
4. Finding an enduring connection with the deceased whilst embarking on a new life (or, continuing bonds)

Figure 3: Worden's Four Tasks of Mourning

The fourth task in Worden's model has undergone much work and re-rewriting, in part due to the influence of Klass et al [177]. Klass et al [81] further developed grief theory by challenging the firmly entrenched notion of moving on from the deceased espoused by Freud [52] and Kubler-Ross [85]. Klass et al brought attention to the importance of *continued bonds* with the deceased, whilst maintaining and forming other relationships. Continued bonds refer to the asymmetric relationship brought about when one person dies. The bereaved may have lost the deceased physically, but they retain shared memories, and a sense of what the deceased was, and can continue an

asymmetric relationship in which the bereaved talks to the deceased (not expecting an answer), and writes cards to them, amongst other things.

2.3.2 Dual Model of Bereavement

In line with the oscillation between tasks implied within Worden's model in regard to tackling tasks, Stroebe and Schut [152] developed the *Dual-process model of grief* (Figure 4). Stroebe and Schut suggest that avoiding grief can be just as helpful as it can be detrimental, depending on the circumstances. This model, rather than focussing on loss like previous models, recognises the importance of feelings – expressing them, and controlling them -, and formally introduces the concept of oscillation. Oscillation between coping behaviours, whereby the bereaved at times confronts the tasks of grieving, and at other times avoids them This oscillatory model acknowledges grief as a dynamic process, in which two stressors are identified: loss and restoration orientation. The model depicts grief as a process in which the bereaved will oscillate between focussing on the deceased (loss orientation) and avoiding focussing on the deceased (restoration orientation).

Figure 4: The Dual Process Model of Bereavement [164]

Loss oriented activities include focusing on the grief and avoiding social or professional obligations, whilst restoration-oriented activities include avoiding the grief and focussing on social or professional obligations. It is argued that both loss and

restoration orientation are necessary for *"recovery"*, but that the emphasis on which will be largely dependent upon the bereaved. Additionally, it is argued that by avoiding grief occasionally the bereaved may be better able to deal with everyday life.

2.3.3 Summary

It is now largely understood that the bereavement experience is unique to the individual, and that many factors, such as relationship to the deceased, can and do contribute to the impact the loss can have [177]. Linear theories which have the bereaved travel from oblivion to salvation [52,85] have been replaced by theories that acknowledge the individuality of bereavement and the multiple trajectories through grief and bereavement, chief amongst these are the Dual-Process Model [152], and Worden's Task-Based Model [177]. In the Dual-Process Model, Stroebe and Schut [152] depict bereavement as a time of oscillation between loss-oriented and restoration-oriented activities, both of which can help the bereaved cope with their loss. They argue the avoidance of bereavement and loss, at times, can be just as important to recovery as reflection on loss can be [152]. Worden [177] posits grief is a process rather than a state, and involves the bereaved engaging (or not) with a series of four tasks the bereaved may experience and may go back and forth between. The idea of continued bonds is that the bereaved need not sever bonds with and move on from someone they have lost. They can maintain a healthy, albeit asymmetric, relationship with the deceased in which the deceased can, for example, be turned to for guidance or confided in. In some cases, however, continued bonds can be problematic and indicate the bereaved is failing to accept the reality of their loss [50]. Previous research suggests this practice of continued bonds to be commonplace [38].

These prevailing theories of bereavement indicate the emphasis is no longer on completing tasks and moving on, but on engaging and disengaging with bereavement in a way that helps the bereaved adapt to their grief and cope with their grief, and on the maintenance of a healthy asymmetric relationship with the deceased.

2.4 Formal Interventions

People who have experienced bereavement often seek formal interventions such as therapy or counselling. Many do so out of a genuine need for help, but others do so at

the insistence of friends or family, or because they believe it is expected under the circumstances. Not all bereaved people need formal interventions, and for those that do, the intervention is not always available or preferential [146]. Formal interventions for bereaved people usually take the form of one to one sessions with a mental healthcare professional, or group sessions with mental healthcare professionals and other bereaved people. These interventions can be more traditional - person centred therapy or counselling in which the bereaved express themselves verbally [6,115] - or less traditional – including person-centred arts therapies in which the bereaved express themselves creatively [3,36,37,99]. A central goal of formal interventions (therapies) is to support the individual to adapt to and assimilate their bereavement and grief [92,180]. In these sessions, bereaved people are encouraged to express themselves and engage with their thoughts and feelings [92]. However, people can be reluctant to express themselves in front of others, feel incapable of doing so verbally, and worry they will be judged if and when they do express themselves [146]. As a result, mental healthcare practitioners seek to (1) provide a safe space in which people feel comfortable expressing themselves, (2) build a therapeutic relationship with the bereaved to make them feel more comfortable, and (3) identify and support the way in which the bereaved person feels most able and comfortable expressing themselves [6,115].

2.4.1 Traditional Interventions

Traditional interventions mostly focus on person centred therapy or counselling in which the bereaved express themselves verbally [6,115]. These involve the bereaved attending sessions with a person or people they may not know or feel comfortable with, where they are encouraged to openly discuss their bereavement and grief. In these sessions facilitators seek to support expression by treating clients with unconditional positive regard (they are empathetic and non-judgemental towards the client) and strive for clear communication, all of which helps facilitate the creation of a positive, trusting relationship, sometimes referred to as a *"Therapeutic Alliance"* [6,115]. Cruse Bereavement Care, a national UK charitable organisation that specialises in bereavement support, describe the one to one support they offer as opportunities for the bereaved to express thoughts or feelings they may have related to their bereavement, and emphasise the counsellor is only there to listen and try to

understand the individual's experience [34]. Despite widely held beliefs that these interventions work [74,150], the prospect of "*establishing the efficacy of bereavement intervention*[s]" [150, p.6] has been described as challenging. An evaluation of the bereavement support provided by Cruse Bereavement Care found bereaved individuals, largely, reported that they found the counselling to have been helpful, and that they experienced less intense grief six weeks after undergoing the intervention [53]. Despite this, they found participants often had to wait a long time from referral to intervention ,and were unhappy about this [53].

Previous research has found formal interventions to be less effective than facilitators believe them to be, and identified a number of issues that negatively impact their effectiveness [74,76]. Kato and Mann argue interventions can struggle to relieve symptoms of bereavement when prevailing bereavement theories are not paid proper consideration, and when bereaved individuals are offered an inadequate amount of time in a support setting [76]. Jordan and Neimeyer found the effectiveness of formal interventions for the bereaved are *"distressingly low…counter to the professional experience of many clinicians in the field"* [74, p. 771]. They offer three interrelated possible explanations for this: 1) formal intervention may not be needed; 2) the timing, and amount of sessions were insufficient and; 3) the type of support needed at different points of the bereavement experience differ. In line with the first and second explanation above, Allambuagh and Hoyt [4] argue that interventions to support the bereaved are more beneficial to those who voluntarily seek help, and do so in the immediate aftermath of loss [4]. Aside from this, the way in which the bereaved is expected to express themselves can prove problematic. People can be reluctant, or feel uncomfortable or incapable of expressing themselves verbally [84,177].

2.4.2 Art Based Interventions

In response to these issues, practitioners continue to explore new ways to increase the effectiveness of the support they provide. Arts Therapies (AT) are increasingly being explored as a supplement or replacement for traditional interventions that rely on verbal expression, as they may facilitate expression for those not comfortable doing so verbally [3]. Art therapists often offer a series of workshops to their clients, holding off on more creative activities until they have had time to build a therapeutic relationship with the client and enable them to feel comfortable being creative

[83,110,117]. AT encourages self-expression through creative pursuits, or the evaluation of creative works. This has been successful in helping those experiencing grief and bereavement, for example, to express their thoughts and feelings, and through doing so improve their health [56,89,134], express themselves and gain new insight [110], and make sense of their loss and face the reality of death by continuing bonds with the deceased by writing about or to them [99].

McClocklin and Lengelle [99] argued that writing has many advantages over talking, especially when undertaken as part of grief recovery. The advantages they reported were that: (1) writing can be done privately; (2) when someone wants to talk about something with someone but feels they are not ready, they can write it down and share it later; (3) the internal dialogue fostered by writing can make it easier to talk to others; and, (4) thinking and writing about bereavement can help normalise bereavement which can make it easier to talk about it. Likewise, similar work suggests creative song writing undertaken in a clinical music therapy setting *"point*[s] *to positive growth in bereaved adolescents through creative songwriting"* [36, p.138]. Songs that emerge from this process are *"often emotional, challenging, and deeply thought provoking, and can provide a valuable contribution to our understanding of the experience of terminal illness, death and loss."* [68, p.106] The latter of these studies explored the potential of music therapy for a somewhat experienced lyricist and a novice. Dalton and Krout [37] conducted a more in depth study investigating the use of music therapy for bereavement groups. The groups would go through the entire songwriting process together, from theme selection, to writing original drum tracks, melodies, and lyrics, to the performance and recording of the song. They found that this process *"proved to be engaging and offered a safe, creative method of addressing the difficult subject matter of a loved one's death."*[37, p.101] Dalton and Krout argued the *"structured flexibility"* of their methodology *"allowed group members to creatively address the five grief process areas and discuss individual issues related to their loved one's death"* [37, p.101] and the lyrics created by participants *"showed insight and creativity in identifying, expressing, and processing personal issues related to areas of understanding, feeling, remembering, integrating, and growing."* [37, p.101] These works suggest that the creation process, and the exploration of the created work, are as important, if not more so, than the final product, and that they may be beneficial for both expert and amateur creatives. Despite this, Wood et al [175] reported some

barriers to AT, which included a lack of understanding of what AT is and a fear of being bad at art - the latter may be the most difficult, yet important challenge to be overcome. Some of the previously mentioned studies [56,99,110] employed writing exercises and timetables to try and overcome these problems. Furthermore, like more traditional therapy AT is not always available in a timely manner (or at all) or affordable [146].

2.4.3 Summary

Formal interventions have been used successfully in a variety of contexts, with more traditional forms benefiting from the therapeutic relationship and exploration of thoughts and feelings [6,53,115,177], and arts therapies opening up the aforementioned benefits of traditional therapies to those who feel more able and comfortable expressing themselves creatively [56,89,99,110]. Despite this, the effectiveness of formal interventions is debated [74,114,115,150], and formal interventions are not always available as, when, and where needed [146]. Additionally, Love [92] believes the bereaved *"usually"* find ways of coping with their bereavement and grief by themselves, and as such the support provided to the bereaved can be community-based. What is clear is that these interventions can be effective for some, and that to increase the effectiveness of support provided to the bereaved it should:

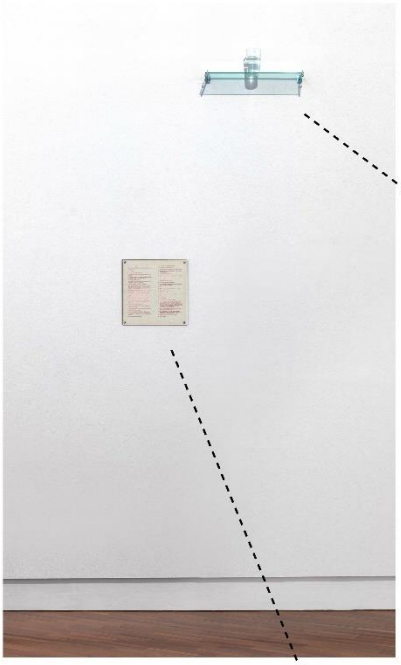
- Consider prevailing bereavement theories
- Be offered as, when, and where needed
- Need not rely on professionals
- Seek to support the bereaved to express themselves in whichever way they feel most able or comfortable

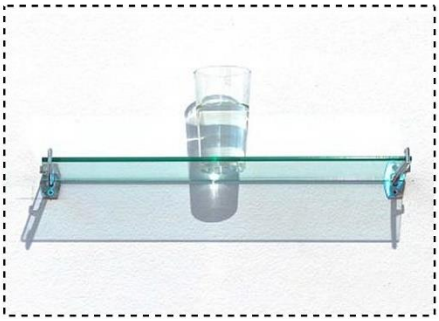
The above is in line with suggestions made by Love [92], who argued that the aim for bereavement interventions should not be to achieve recovery but to provide bereaved individuals with the level of support they require to adapt to their bereavement and express *"their grief in their own manner"* [92, p.12].

2.5 Computational Creativity

Computational Creativity (CC) is the art, science, philosophy and engineering of *"computational systems which, by taking on particular responsibilities, exhibit behaviours unbiased observers would deem creative"* [31, p.1]. Researchers draw on philosophical, cognitive, psychological and/or sociological studies of human creative behaviour and put them into a context of creative intelligent systems to design, develop and evaluate software systems in a wide range of domains. These include music [2], literature [30,103], art [28], and scientific discovery [61] (see [11,100] for more).

Typically, these systems take in some information from the target domain and employ a range of *artificial intelligence* (AI) – software that seeks to imitate cognitive functions associated with the human mind such as learning or problem solving - techniques to generate novel artefacts and automatically evaluate them according to pre-set aesthetic criteria such as the appropriateness and relevancy of what has been created in comparison to what inspired it [30]. Social and interactive aspects of creativity have been modelled, including individual and social creativity, diffusion of ideas, collaboration and creativity, formation of creative teams, and creativity in social settings [11,39]. In recent years the importance of systems producing *framing information* – information that accompanies and explains the creative process behind their output - has come to the fore [24,131]. Framing information is information that details the process through which the artefact was created, and the artefact itself [24,131]. A commonly used example that CC researchers use to illustrate framing information and its importance comes in the form of artist Michael Craig-Martin's An Oak Tree [24]. This work is comprised of a glass of water on a shelf, and accompanying text, and has been exhibited worldwide (see Figure 5 below).





Q. To begin with, could you describe this work?
A. Yes, of course. What I've done is change a glass of water into a full-grown oak tree without altering the accidents of the glass of water.
Q. The accidents?
A. Yes. The colour, feel, weight, size …
Q. Do you mean that the glass of water is a symbol of an oak tree?
A. No. It's not a symbol. I've changed the physical substance of the glass of water into that of an oak tree.
Q. It looks like a glass of water.
A. Of course it does. I didn't change its appearance. But it's not a glass of water, it's an oak tree.
Q. Can you prove what you've claimed to have done?
A. Well, yes and no. I claim to have maintained the physical form of the glass of water and, as you can see, I have. However, as one normally looks for evidence of physical change in terms of altered form, no such proof exists.
Q. Haven't you simply called this glass of water an oak tree?
A. Absolutely not. It is not a glass of water anymore. I have changed its actual substance. It would no longer be accurate to call it a glass of water. One could call it anything one wished but that would not alter the fact that it is an oak tree.
Q. Isn't this just a case of the emperor's new clothes?
A. No. With the emperor's new clothes people claimed to see something that wasn't there because they felt they should. I would be very surprised if anyone told me they saw an oak tree.
Q. Was it difficult to effect the change?
A. No effort at all. But it took me years of work before I realised I could do it.
Q. When precisely did the glass of water become an oak tree?
A. When I put the water in the glass.
Q. Does this happen every time you fill a glass with water?
A. No, of course not. Only when I intend to change it into an oak tree.
Q. Then intention causes the change?
A. I would say it precipitates the change.
Q. You don't know how you do it?
A. It contradicts what I feel I know about cause and effect.
Q. It seems to me that you are claiming to have worked a miracle. Isn't that the case?
A. I'm flattered that you think so.
Q. But aren't you the only person who can do something like this?
A. How could I know?
Q. Could you teach others to do it?
A. No, it's not something one can teach.
Q. Do you consider that changing the glass of water into an oak tree constitutes an art work?
A. Yes.
Q. What precisely is the art work? The glass of water?
A. There is no glass of water anymore.
Q. The process of change?
A. There is no process involved in the change.
Q. The oak tree?
A. Yes. The oak tree.
Q. But the oak tree only exists in the mind.
A. No. The actual oak tree is physically present but in the form of the glass of water. As the glass of water was a particular glass of water, the oak tree is also a particular oak tree. To conceive the category 'oak tree' or to picture a particular oak tree is not to understand and experience what appears to be a glass of water as an oak tree. Just as it is imperceivable it also inconceivable.
Q. Did the particular oak tree exist somewhere else before it took the form of a glass of water?
A. No. This particular oak tree did not exist previously. I should also point out that it does not and will not ever have any other form than that of a glass of water.
Q. How long will it continue to be an oak tree?
A. Until I change it"

Figure 5: Photograph of An Oak Tree, and text (with text and glass on shelf enlarged) [33]

The text itself takes the form a question and answer session written by Michael Craig-Martin. The text serves as An Oak Tree's framing information, and the artist uses it to provide an *"artistic"* explanation of how he has transformed a glass of water into an oak tree – without it the title makes less sense, and the experience of the installation as a whole suffers. The framing information presented alongside An Oak Tree consists of the artist explaining what he has, purportedly, done (changed a glass of water into an oak tree), and an evasive answer as to how he has done so. Charnley et al [24] argue framing information for CC systems should similarly explain what has been done (the processes), why it has been done (the motivation), and what was meant by doing it (the intentions). To cover these three bases Charnley et al believe CC systems should employ framing information that explains:

- The motivation behind creation
- Why the system does what it does
- The intention of creation
- What the system means when it does what it does
- The process, how the system did what it did

In addition to this, for systems that require user interaction, framing information should also explain the influence the user has had over the artefact created, how the system uses their input in the creative process, and possibly the effects the user had on the artefact created. In relation to this, a small amount of work has explored collaborative systems that include the user in the creation process [e.g. 15,37]. This collaboration between human and computer usually comes in the form of the user creating some input, usually text, which the system then analyses either for sentiment or word similarity. *Sentiment analysis* -the process of using computational means to calculate, categorise, and identify opinions or emotions present in text - is used by some of these systems, even those without user input, to create output reflective of the input [30,103]. The sentiment analysis carried out by these systems is done by calculating the emotion of user input in relation to a predefined set of emotional characteristics and then choosing words or themes reflective of these emotional scores.

The most commonly explored CC systems are those that generate text, images, and audio. These systems have often been developed by and to support experts in the

creative field in which the system operates, for example systems created by painters to paint. They have been created to support and augment the creative works of artists, to generate artistic output of their own, and to help people to be creative. These systems used to rely on *constraint-based approaches* – approaches that make use of hard coding and formatting measures or derive these from analysing corpuses of text. These approaches can be as simple as defining a poem as a title and two lines, and then defining what should be in the lines, for example:

Poem = Title + Line 1 + Line 2

Title = [**RANDOM WORD**]

Line 1 = [ADJECTIVE] as the [NOUN]

Line 2 = [ADVERB] [PRONOUN] [VERB] the [NOUN]

The computer would then be tasked with populating this template with a random adjective etc where appropriate. The above template, for example, could become:

Vicissitude

Brave as the Tiger

Gently she picked the flower

Systems can also learn to create these templates by themselves by analysing a corpus of poems, or text and likewise learn what words are often used together. Modern systems often make use of the corpus approach to discern their own rules and formats and learn to play instruments or write autonomously.

2.5.1 Early Examples of CC Systems

As early as the 19th century, Ada Lovelace reportedly predicted the advent of a system or systems that *"might compose elaborate and scientific pieces of music of any degree of complexity or extent"* [93, p.270][1]. Only a century later Alan Turing created a system (MADM computer) that jokingly generated love-letters by randomly selecting and inserting nouns and adjectives into a template [11]. One of the earliest examples

[1] More notes on the subject made by Ada Lovelace can be found here: http://www.fourmilab.ch/babbage/sketch.html

of computational creativity was Hiller and Isaacson's use of the ILLIAC I computer to generate music for a string quartet, known as the Illiac Suite[2], by translating compositional rules into computational rules [11].

The two most notable pioneers of Computational Creativity, however, were Harold Cohen and David Cope. Cohen was a successful artist who, upon realising the possibilities offered by computational creativity, abandoned his career as a traditional artist in pursuit of a career as a computational artist in collaboration with his renowned system AARON [100]. His works have been displayed internationally for decades (see Figure 6, Figure 7, and Figure 8 for examples), over which time AARON and their co-created works have improved drastically, with Cohen reportedly joking, *"I am a first-rate colourist. AARON is a world-class colourist"* [11, p.viii].

Figure 6: An early drawing by AARON [26]

Figure 7: A painting drawn and coloured by AARON [182]

Figure 8: Cohen colouring one of AARON's drawings [183]

Cope, on the other hand, was a well-known musician and composer who taught musicology at the University of California, Santa Cruz. Much like Cohen's program, Cope's too was given a humanlike name, Emmy. Emmy composed new musical pieces in a myriad of genres, and astounded critics who previously had refused to accept a computer could generate music of worth[3]. Unlike some of the other systems, however, Emmy wasn't restricted to producing aesthetically pleasing output. It was capable of producing output that wasn't aesthetically pleasing [11]. Both AARON and Emmy, in

[2] A snippet of the Illiac Suite for String Quartet can be heard here: https://www.youtube.com/watch?v=n0njBFLQSk8

[3] An example of music generated by Emmy can be heard here: https://www.youtube.com/watch?v=2kuY3BrmTfQ

the earlier days, used constraint-based approaches to creation, relying on rules to generate art that Cohen and Cope deemed acceptable [11]. These rules were translations of rules Cohen and Cope adhered to when creating their own paintings, and music, as human artists. AARON, for example, evaluated lines using calculations, used rules implemented by Cohen to determine its next step, and analysed the blank space left to be filled [27]. Emmy analysed music entered into a database and would use this to direct the generation of new music of a similar style [32].

2.5.2 Modern Examples

Almost a century has passed since the creation of Turing's MADM computer, and in this time CC systems have become more sophisticated. The systems of Simon Colton are arguably some of the most well-known and illustrative examples of modern CC, and cover image and poetry generation. The Painting Fool [28] began as a relatively simple system that would reproduce a photograph in a more artistic way, but over the years, it developed and became a system that can paint based on user input, and that can use sentiment analysis to paint in styles reflective of the user's mood (see Figure 9 for an example).

Figure 9: An image created by the Painting Fool [29]

Full-FACE Poetry Generation [30], on the other hand, is a more complex system. It uses a corpus of text mined from the internet. This corpus is mainly comprised of articles and phrases mined from the Guardian newspaper, and similes drawn from another system (the Jigsaw Bard). It utilises *natural language packages* - scripts or software that support language processing - for sentence extraction, pronunciation, word similarities, key phrase extraction, and sentiment dictionaries. The system retrieves similes, possible variations of the retrieved similes are produced and evaluated, and finally the similes, variations, and key phrases extracted from the Guardian are combined as per user instructions to form the poem. The end result is the generation of a poem based on, and reflective of that day's Guardian articles and their mood. Other systems, such as Misztal's Blackboard Poetry Generator have been influenced by the *Global Workspace Theory* – which the authors describe metaphorically as a shared workspace in which a group of experts each work on a project they are expert in to contribute to the fulfilment of the project as a whole. [103]. Misztal's Blackboard Poetry Generator uses a more diverse series of agents or modules in the creation of poetry. Each module works towards single tasks, such as sentiment analysis, finding similar words, punctuation, and eventually creating an emotional poem based on the user's input.

ALYSIA is an example of a more collaborative, co-creative CC system [2]. ALYSIA, as a co-creative system, aims to enable people who are not musicians to write and create a song [1]. The co-creative process consists of the user being given a series of choices over which genre of song they want to create and gives them the choice of several potential backing tracks. After this, the user is asked to select or write topics to influence lyrics the system will suggest to the user: these topics include love, anger, loss, etc. Once the topics have been selected or input, the user is then presented with a series of lyrical suggestions (based on their chosen topics) for the song which they can regenerate and are then tasked with selecting or writing the lines for the song. ALYSIA generates suggestions for subsequent lines based on previous selections/inputs, adapting to the user's style if they choose to write any of the lyrical lines. The user is then presented with a series of melodies from which they select, that fit with the lyrics and that can be edited. Finally, the user progresses to the generation of the song itself and is given the choice of whether they wish to sing the song themselves, or have ALYSIA sing it in a male or female voice.

2.5.3 Summary

Early CC systems were predominantly expert based systems. Systems that generated music were often created and used by a skilled artist, systems that generated music, for example, tended to be created and used by a skilled musician. Over time, however, this has changed. CC has evolved to the stage where non-expert users can create systems, and these systems can be used by non-experts with minimal difficulty. Despite this, little work has explored how these systems could be employed to help people outside of a creative context. CC systems are not only concerned with creative writing but, amongst other things, painting [28], and music [2]. Many of these systems are designed to be as autonomous as possible [30,145] but some are designed as co-creative and are intended to work with users in creative pursuits [2,39,75]. Creative systems such as these provide opportunities for bereavement support, especially co-creative systems that include the user in the creation process, and that analyse the emotional value of whatever input it uses as inspiration for whatever it outputs - similar to PoEmo [103] that analyses blog posts to create poetry reflective of the emotion of the post. CC systems designed to support the bereaved could support users in expressing their feelings in whichever manner they feel most comfortable, e.g. writing, creative writing, painting, etc, and lead to the creation of memorial possessions, or possessions that incite reflection. Additionally, research has largely overlooked other potential applications of CC, for instance the impact CC could have on feelings of ownership over possessions created by - or co-created with - a CC system, the importance of user inclusion in the creation process, and output (or possessions) to be consumed by users rather than researchers.

2.6 Digital Possessions and Ownership

2.6.1 Physical and Digital Possessions

Herein, a *possession* is defined as something a person can own legally or be informally granted ownership over through inheritance or as a gift. Physical possessions have existed for millennia [153] and refer to something the owner has purchased, created, inherited, or is in possession of [13,57]. These possessions may only be in the possession of one person at a time. Even an individual copy of a mass-produced book like Lord of the Rings is distinct in that one person buys a copy of it, controls access

to it, and it can be altered and accrue a sense of history – each characteristic can make the book unique.

Digital possessions don't have the same characteristics as physical possessions, and as such people can have a different understanding of just what a digital possession is [59]. An eBook purchased from Amazon, for example, is simultaneously available on the Kindle and any other device with the Kindle reading app installed. Digital possessions are intangible and accessed through technological devices such as smartphones or laptops. Cushing [35] expands on this: *"digital possessions are characterized as (a) providing evidence of the individual, (b) representing the individual's identity, (c) being recognized as having value, and (d) exhibiting a sense of bounded control."* [35, p.1723].

2.6.2 Aspects of Ownership

The legal definition of *ownership* can refer to the possession of an artefact, or the right to possess it. Etzioni, as quoted in Pierce et al [139], argued this is too simplistic a definition, and posited ownership to be a *"dual creation, part attitude, part object, part in the mind, part 'real'"* [139, p.84]. He argued that the *legal* definition of ownership covered only one aspect, and proposed a second aspect of ownership – a *symbolic* and *contextual* aspect. This symbolic and contextual aspect is often referred to as *Psychological* ownership. Psychological ownership relates to feelings of ownership a person has related to an artefact, place, or job (amongst other things)[40,139,159]. It is much more complex than legal ownership, in part due to its more abstract nature, and has been found to influence the value that people attribute to artefacts more than legal ownership does [142,159]. Whilst legal aspects of ownership are influenced by the possession, or right to possess something, psychological ownership is influenced contextually by the relationship between person and artefact, and through cultural norms or beliefs surrounding ownership [139]. Psychological ownership is more complex than legal ownership, in part due to its more abstract nature, and has been found to influence the value that people attribute to artefacts more so than legal ownership [142,159].

Despite ownership generally concerning relationships between people and tangible artefacts, ownership can also be felt over intangible artefacts, including words and artistic output. Isaacs, cited by Pierce et al [139], discovered that children felt

ownership over nursery rhymes and songs if they were the first to hear them, and felt others needed their permission to listen to or sing them. Heider [69] likewise explored similar feelings of ownership over scientific breakthroughs, ideas, and inventions, experienced by scientists [139].

Ownership becomes even more complicated when it relates to digital possessions. People can feel less ownership over digital possessions than their physical counterparts as a result of many factors, including a traditional understanding of ownership, feelings of lessened control over digital possessions, because digital possessions can have multiple owners, be easily copied, stored in multiple locations and be accessed by a lot of people [59,90,102,122,125,136]. Despite this, digital possessions contribute to the fulfilment of the three human needs that lead to feelings of psychological ownership [35,40]:

- *Efficacy* – possession of an artefact can provide a sense of power, control, or influence
- *Self-identity* – possession can reflect a person's identity
- *Belongingness* – possessions or a sense of ownership can provide a person with a sense of place or belonging

Digital possessions support self-expression [106,161] which can contribute to the 3 human needs listed above. Digital possessions also reflect social ties [95], provide a connection to the past [80], and to those no longer here [106,172], all of which can also contribute to the aforementioned 3 human needs. This suggests any works carried out to increase feelings of ownership over digital possessions may benefit from a focus on psychological ownership.

2.6.3 Ways to Increase Psychological Ownership

Pierce et al [139] identified the following three major contributors towards feelings of psychological ownership: (1) control of the possession; (2) intimate knowing, or coming to know and understand the possession through association with it, as a gardener does a garden as a result of working in it; and (3) investment of the self, or investing the self in the possession. Any or all of these can result in feelings of psychological ownership, but the ownership felt may be stronger if more than one

contributor towards psychological ownership is present. Pierce et al [139] go on to speculate that control and investment of self may be the contributors with the most potential to generate psychological ownership, as the person will come to know the possession and its properties by exerting control over a possession or investing themselves within it.

2.6.4 Value from Ownership

Feelings of ownership allow people to fulfil a series of three basic human desires [40]:

1. The desire to own something and be in control of it, and to feel effective and competent
2. To define, express, and maintain their self-identity
3. To find or make a place (home) they feel is theirs

If and when these desires are fulfilled, people feel better about themselves, and in the process form an intimate link between the possessions they feel ownership over and themselves [139]. As a result of this link between possession and self, the artefacts that people feel ownership over are seen by their owner as more attractive, favourable, and more valuable than artefacts that they feel no ownership over [40,48,139,142,178]. Additionally, upon assuming or perceiving ownership over an artefact, people often feel a sense of responsibility for it - they become the steward of the artefact and feel responsible for protecting, maintaining, and enhancing it [139]. Not all the effects of ownership are positive, however. The loss of a possession that one feels ownership over can lead to feelings of loss, a blow to personality if the possession expressed self-identity, and feelings of depression [139].

2.6.5 Psychological Ownership and Emotionally Valued Digital Possessions

HCI research has explored the ownership of virtual goods in virtual worlds [88] and the creation of valued possessions by investigating how to strengthen the connection between a person and possession [70,121]. Research [88] has shown that users of

software such as Second Life[4] tend to feel stronger levels of ownership over the virtual worlds that they inhabit and the items they possess within them compared to the ownership felt by *"traditional"* web site users. This was attributed to several factors, including perceived control of the virtual possessions. Research has also explored the creation of an emotional link between person and possession and the creation of possessions that serve as conduits for reflection and communication related to bereavement - which can contribute to psychological ownership [79,106,120,122]. Researchers have also explored the creation of cherished possessions [59,127], and emotional attachment to digital possessions. The emotional value of cherished possessions is influenced by their relevance to self and their position within one's life [127]. Digital possessions have been found to successfully express individuality and represent social identity [63,65,95,176], and remind us of our past and those we have lost [80,106]. A common theme throughout these works is the form a possession takes - its *materiality*. Many of these studies suggest people do not value digital possessions as much as physical possessions. These studies have resulted in the identification of a series of design goals and objectives, and areas that warrant further exploration. These recommendations or suggested explorations seek to contribute to the design of technology or possessions that are more cherished, and that can be considered as heirlooms [8,42,59,125,127]. Researchers have recommended that digital possessions should stress individuality and a sense of belonging or connectedness [127], and should involve the user or owner in their creation and support self-expression [59].

2.7 HCI Approaches towards Technology to Support the Bereaved

As early as 2008 HCI researchers were aware of the ways that people were repurposing technology in response to bereavement [78]. In this work, Kirk and Banks commented that they had observed an increased interest in online memorials, and ritual practices in online communities. They also expressed their desire to explore the relationship people have with their possessions, digital and physical, and whether physical

[4] Second Life is an online virtual world in which users can create avatars, socialise with other avatars, and build, buy, and sell virtual goods. For more information, see: https://secondlife.com/

possessions could be augmented by introducing characteristics of digital possessions, and vice versa. Through these explorations of materiality, they sought to inform the design of technology heirlooms that transform how people view their digital possessions [78]. A year later, Massimi and Charise argued *"the urgent need to consider the facts of mortality, dying, and death in HCI research"* [98, p.1] and acknowledged:

> *"computing technologies inescapably intersect with the facts of human mortality, dying, and death. However, these technologies are not yet designed to effectively acknowledge – or engage with – the inevitable death of their user." [98,* p.2*]*

They introduced the concept of *thanatosensitivity*, an approach to the design of technology that considers death, dying, and morality [98]. They describe thanatosensitivity in an HCI context as a *"novel, humanistically-grounded approach to HCI research and design that recognises and actively engages with the facts of mortality, dying, and death in the creation of interactive systems."* [98, p.6] Lindley et al, a year later, noted:

> *"Shifts in the field of HCI (Human-Computer Interaction) coupled with the growing maturity of interactive technologies is leading researchers and designers to consider issues relating to mortality." [91,* p.1*]*

Massimi and Charise suggest this focus on death, dying, and mortality could lead to advances in user-centred design research, and the creation of intelligent systems (amongst other things) [98]. Since these early calls to consider death, and bereavement in the design of technology, various studies have been conducted. These have explored the theory of what should be considered when designing for the bereaved [51,96,97,107], the use of repurposed technology to support the bereaved [18,25,45,71,143,173] such as Facebook, and the design of novel technologies specifically designed for the bereaved [60,79,106,167]. Each of these will be discussed in turn.

2.7.1 Theory

Theoretical work in HCI has sought to determine what should be considered when designing technology for the bereaved, and has resulted in the development of a series of guidelines, frameworks, and models for the design of technology to support the bereaved [51,96,97,107]. Foot et al [51] explored web-based memorialisation in the aftermath of the September 11 attacks against the United States of America that resulted in almost 3,000 confirmed deaths and the destruction of The Twin Towers[5]. They identified seven considerations for the study of web-based memorials:

1. Object or focus of commemoration, does the memorial commemorate an abstract concept such as loss of security or does it focus on something specific or personal such as the loss of lives?
2. Co-production, is the memorial the product of an organisation, an individual, or a group of people?
3. Voice, is the memorial to present one narrative or many?
4. Immediacy, how quickly was the memorial created in response to the bereavement?
5. Fixity, how static is the memorial, can it evolve and change over time?
6. Intended audience, for whose use is the memorial designed?
7. Relational positioning of victims, are the memorials personal or general?

Many of these areas of consideration can be extrapolated to the design of bereavement support tools, and provide useful guidance, such as whether it is designed to support private or collaborative use, should there be one narrative or several, should progress of bereavement be made apparent, and who should have access to the tool. Similar work by Moncur and Kirk [107] explored the development of a framework for the creation of digital memorials. They identified four key elements to be considered when designing technology for the bereaved:

[5] For more information on the September 11 attacks, see: https://www.britannica.com/event/September-11-attacks

1. The actors, or those who create and consume the memorials
2. The input, what the subject of the memorial is (e.g. history of a life) how the circumstances of loss can affect this, and what is used to create it (e.g. possessions that once belonged to the bereaved or memories of the deceased provided by bereaved individuals)
3. The form, or the physicality of the memorial (e.g. physical, digital, hybrid)
4. The message, which will be influenced by the who creates the memorial and its intended audience

Massimi and Baecker more explicitly explored opportunities for the design of technology for the bereaved [96], examining the inheritance of digital devices and the use of technology to remember the deceased [96]. Two key findings are highlighted here. Firstly, that inherited digital technologies can facilitate the maintenance of emotional connections between the bereaved and the deceased. Second, that this inheritance can lead to the discovery of information about the deceased that the bereaved would rather not have known. This second finding concerned participants who wished to respect the privacy of the deceased, but they acknowledged that such discoveries could shed new light on the deceased. As a result of these explorations, Massimi and Baecker formulated a list of opportunities and challenges for the design of technology to support the bereaved. The most relevant of these are that (i) digital possessions will become more prominent and meaningful as generations that have grown up using digital technology age, and (ii) that there is a lack of technologies designed to support to the bereaved. In a later study, Massimi and Baeker further explore these opportunities and other relevant works, and offer a series of design guidelines for the development of systems for the bereaved [97]. They report that bereaved people value social support, but that the bereaved may be reluctant to burden those within their social circles, and that those they do communicate with can become drained. Massimi and Baeker also identify problems faced by other forms of support as well: chiefly, that therapists can be costly and are not always available, and that online support is not always credible or trustworthy. They argue that systems should:

- Not be designed to *"solve"* grief as this could have negative consequences

- Be designed with the understanding that communication is not always necessary or helpful, and that communication with family and friends is not always helpful
- Encourage or make use of extra-familial sources of support
- Support storytelling, which can allow the bereaved to work through their feelings and reminisce
- Be designed in a way that acknowledges the reality of physical loss, and the potential continuation of an asymmetric relationship between bereaved and deceased
- Offer people the opportunity to create personal or meaningful possessions, alone or in a group
- Support a wide range of input over time
- Give the bereaved user control over what is created and what is visible
- Be designed with the understanding that the person who has experienced bereavement will continue living and eventually adapt to bereavement

2.7.2 Repurposed for Bereavement

As digital technologies has become more deeply embedded in daily life, people have appropriated it to suit their needs – even in the case of bereavement [143,171]. Research suggests bereaved people who use online support tend to be younger, female, and less religious than those who have not turned to the internet for support [47,71], and that they view it as supplementary to social or professional support [71]. Internet use in general has been shown to reduce the risk of bereaved people experiencing *Post-traumatic stress disorder* - an anxiety disorder caused by distressing, frightening, or stressful events[6] -and complicated grief, by mitigating feelings of loneliness and boosting self-esteem through the provision of a safe way to remain social in which the bereaved feels in control and able [168]. Research has shown websites and pages support bereaved people with memorialisation and ritualization [18,144], continue

[6] For more information on Post-traumatic stress disorder see: https://www.nhs.uk/conditions/post-traumatic-stress-disorder-ptsd/

bonds with the deceased [135], provide a safe space for self-expression and the continuation of bonds [25,144], and provide bereavement related education [148]. Similarly, online support groups, forums, and chatrooms have been found to increase participation in support groups by providing 24/7 access to support, by making participation easy, and providing support to those who feel stigmatised [47]. Additionally, this avenue of online support has been found to provide a safe space in which the bereaved can express themselves and seek support from other bereaved people, and continue bonds with those they have lost through writing posts about their experiences, or messages to the deceased [25,45,144].

The above successes are promising, but not universally felt. The reliance on online user interaction for many of these potential sources of support can prove problematic. These websites and pages are not only available to genuine, bereaved users, but to potentially malicious users (trolls), who can deface memorials and harass genuine users by defacing memorials or sending negative messages [25,147,173]. Pennington [135] found that Facebook was only helpful for bereaved people who had used it frequently prior to bereavement. For those who had been infrequent users prior to bereavement, it was unhelpful. Participants who found Facebook helpful were torn between wanting to visit the deceased's page, and wanting the page deleted to avoid sharing their grief outside their social circle [135]. Another study found that Danish Facebook users viewed Facebook as an inappropriate platform to express the intimacies of bereavement, with 47% of 166 participants viewing online, public mourning and remembrance on Facebook negatively, and only 12% viewing it positively (the remainder viewed it neutrally) [147]. One study found online mutual bereavement support had no effect on the bereaved person's wellbeing but acknowledged its impact (positive or negative) may have happened prior to participation in the study, and that 3 months (the time between wellbeing checks) was perhaps too short a time for changes in wellbeing to become apparent. They found that people who had used online bereavement support for a time and then stopped reported better mental health than those who continued to use the support. This could be as a result of the bereaved no longer using the support when they feel better, but it could also be the case that they felt better after they stopped using the system [71].

2.7.3 Designed for the Bereaved

More practical work within HCI - such as Moncur et al's Story Shell [106], Uriu and Odom's Fenestra [167], and Kirk et al's Spomenik [79] - has explored the creation and deployment of technology designed for the bereaved, and its reception. Story Shell [106] took the form of a bespoke memorial (see Figure 10) created for and with a bereaved individual which, despite problems in its creation and use, proved beneficial to the bereaved individual.

Figure 10: A photograph of Moncur et al's Story Shell [106]

The study sought to include the bereaved in the creation of a memorial artefact, Story Shell. This participant inclusion culminated in the participant audio recording a series of memories or messages about, and sometimes to the deceased that would be implemented into Story Shell. Moncur et al found that the participant felt they had benefited therapeutically from recording memories to be incorporated into Story Shell. Moncur et al report the therapeutic benefits were a result of the participant feeling they had a receptive audience in the researchers, who were interested in hearing about the deceased. This led the participant to expressing how they felt about their bereavement at that time, stating they found it difficult at times to reconcile themselves to a world without the deceased, a world that had started to move on from the deceased. Additionally, the participant mentioned they found themselves addressing the deceased in some recordings. This continuation of bonds may have likewise contributed to the therapeutic benefits the participant felt. Despite this success, Moncur et al and the participant found other people were reluctant to contribute

recordings for Story Shell as they were unsure what to record and were wary of the recordings being shared. This suggests systems, much like therapies, that facilitate user participation in the creation of memorial artefacts could be helpful for the bereaved but emphasises that these systems should be able to be used privately. Stevens and Truong, who explored the use of technology to facilitate digital curation technologies [161], reported similar findings to Moncur et al [106]. Their participants felt that the act of creating digital archives supported self-expression, and was therapeutic. Stevens and Truong identified a series of recommendations for curation technology, one of which argued that systems should encourage users to tell stories about memorable or interesting events and experiences, and provide interactions that may be emotional, and relevant long after the interaction.

Fenestra [167], on the other hand, was inspired by Butsudans, or Buddhist altars. These are commonly found in Japanese homes and temples, and memorialise the deceased. Butsudan often contain or are situated near to religious and personal artefacts, including paintings of deities, images of the deceased, and candles. Fenestra, itself, reflected this and was comprised of a round mirror and photo frame both of which accessed and displayed digital photographs, and a real candle that could control the photographs with its flame (see Figure 11).

Figure 11: An image of Fenestra, with the candle lit and displays on

Uriu and Odom found that Fenestra allowed participants to personalise their memorials and memorial practices in ways they could not with the more traditional butsudan. One participant introduced items that were created by or meaningful to the deceased, to create a more reflective memorial. Additionally, they found participants responded favourably to Fenestra, cycling through photos in response to the flickering

of candlelight. Participants reported this lack of control helped them to phase in and out of thinking about the deceased. Participants also remarked the digital nature of Fenestra allowed them to engage with more photos than a traditional butsudan would have allowed, and that this supported memorialisation. Similar work that explores digital Buddhist altars suggests that whilst they can offer more affordable, personal, and secular ways to memorialise and remember the deceased, designers should be sensitive of cultural and religious practices associated with memorial artefacts and memorialisation in general [60].

Kirk et al's Spomenik, unlike Story Shell and Fenestra, was designed to memorialise Slovenian victims of Stalinist purges in the aftermath of World War II [79]. It was designed for multiple people, not necessarily people bereaved of the victims, or bereaved at all. Spomenik itself was an audio guide accessible at the site of the purge through mobile phones. The audio consisted of an actor narrating the account of someone who survived the purge at the site. Participants, at the end were able to leave a recording of their experience of Spomenik. Kirk et al found participants spoke positively of the dyadic interaction with the system and felt Spomenik allowed them to experience the testimony by themselves despite being part of a large group. This highlights the potential for interactive systems to facilitate individual engagement with bereavement, even for those who are not alone but may not want those they are with to know how they feel.

2.7.4 Summary

The results of these explorations suggest that technology designed to support the bereaved should:

- Be designed with prevailing bereavement theories in mind, to support oscillation between engagement and avoidance of grief, and the continuation of bonds between bereaved and deceased where appropriate
- Support expression, in private or with others
- Accommodate the use of various forms of input that the bereaved user may have at their disposal, for example text messages or photographs
- Protect the privacy of the bereaved, and deceased

- Provide new ways to engage with their bereavement and grief
- Facilitate the creation of meaningful possessions

2.8 Towards the Design of CC Bereavement Support Tools

Research into grief suggests that, for a minority of people, formal interventions are necessary for them to overcome and adapt to their grief and bereavement, but that the majority often require little to no help. Formal interventions can prove difficult to access, and ineffective for those who require little to no formal help. However, these people may benefit from informal support in the form of CC bereavement support tools, that strive not to *"cure"* them of their grief, but to help them express themselves first and foremost, and secondly to create meaningful possessions reflective of what has been expressed.

This project looks at informing the design of CC systems to support bereaved people who have experienced uncomplicated grief, and as such are less likely to require formal interventions to adapt to and process their bereavement and grief. To do so, this project takes into consideration prevalent bereavement theories: that the bereaved should receive support to express themselves, reminisce, interact with their feelings, and continue bonds with the deceased when appropriate.

CC provides an opportunity for technology to incorporate techniques associated with traditional and arts therapy into bereavement support tools that can overcome problems associated with each form of therapy. Bereavement support tools can be used from the safety and comfort of the bereaved person's home, which allows the user to access the support as and when they please, and to spend as much time as they desire interacting with it. Additionally, as the bereaved user interacts primarily with a computer, they need not worry about anybody seeing or judging their thoughts or feelings, or any creative pursuits they undertake to help with their bereavement – unless they choose to let someone in on the process or see the end product.

Much of the HCI work on digital memorials and technology for the bereaved emphasises remembering rather than reflection – *"Considering and analysing past, present and future experiences in order to reassess our thoughts, beliefs, feelings and*

actions…" [104, p.2] - and require the user to interact actively with sensitive and potentially upsetting possessions. There are very few, if any, systems available to the bereaved that place an emphasis on self-expression and reflection, and somewhat shield the user from potentially upsetting interactions either with possessions or people. Even less of these (none to my knowledge, other than the work presented herein), consider how CC could be used to create more useful, interactive systems in general, and for the bereaved specifically. The field of computational creativity is currently more focussed on the act of creativity than on how it can be employed meaningfully. Early HCI work that explored the design of technology for bereaved individuals indeed called for the use of intelligent agents to be explored.

2.9 Design Opportunities for Bereavement Support

We have identified the following challenges and opportunities in current approaches to bereavement support:

Grief can be difficult to deal with but does not always require formal interventions. It is not a linear journey from travesty to salvation but an oscillatory process through which the bereaved engages with and disengages from the bereavement and grief.

Therapy and counselling are not always available to those that need it, and when they are, they are not always affordable or available as and when needed. Formal interventions are not always needed or effective, especially with those who have not experienced uncomplicated grief. The success of formal interventions is theorised to be based on whether prevailing bereavement theories are considered, and whether the intervention supports the client to express themselves in whichever way they are most comfortable.

Current technological options face similar problems, such as availability and cost but also face more nuanced challenges such as the reliability of service continuation and that they often require the bereaved interact with possessions related to the deceased or interact with other people who may be malicious. Additionally, the focus of these technologies on curation of already existent possessions preserves the deceased in situ more so than promoting continued, reflection on the deceased and their relationship with them. This focus on curation over creation also presents challenges to the creation of meaningful digital possessions, which can be overcome by having the bereaved

participate in the creation process to create personal, reflective, possessions that mark a significant event in their life.

We posit a CC bereavement support tool that encourages self-expression could help the bereaved and tackle the aforementioned challenges: A widely available and affordable technological option would provide a means of support for those who therapy is not affordable or available (when needed or at all); A technological option that can be used privately would provide an environment in which the bereaved did not have to express how they feel or be creative with another person present – who they may fear judgement from; and finally, the creative element would allow bereaved people to interact with their grief in more nuanced ways which may better suit their preferences and allow for the creation of new possessions reflective of their relationship and/or the deceased. The research carried out as part of this PhD seeks to explore the design of CC bereavement support tools that overcome the aforementioned challenges and support bereaved people to express themselves, and through doing so create meaningful possessions.

Chapter 3

3 Methods

3.1 Introduction

The research conducted and reported on in this thesis falls under the umbrella of HCI. HCI is a multidisciplinary field that explores the design and use of interactive technology. The work presented herein focuses on the development and evaluation of design goals and objectives for interactive systems that employ computational creativity to be used by the bereaved. This chapter begins with an introduction to user centred design, user experience design, research for and through design, and research in sensitive contexts, discussing the influence each has had on the approach taken towards the work reported in this thesis. The research methods employed to collect, and analyse the data gathered from the studies are also documented.

3.2 Methodological Influences

Research methodology refers to the approach taken when designing and conducting research or studies. Methodology concerns itself with what we want to know, how we find it out, and how we interpret it. Methodology, as such, helps the researcher to choose the methods that will be used to gather and analyse data, and report the results. Neuman describes methodology as *"understanding the entire research process – including its social-organisational context, philosophical assumptions, ethical principles, and the political impact of new knowledge from the research enterprise."* [44, p.2], and *methods* as the collection of techniques used to gather, analyse, and report on data [44]. In the following four subsections, the methodologies that have influenced the research methods used in this thesis are presented: user-centred design; user experience design; research for design and research through design; and research in sensitive contexts. These methodologies are described, and justification given for

their consideration in the design of bereavement support tools for the bereaved that make use of CC.

3.2.1 User-centred Design

User-centred design (UCD) is a methodological approach used to create usable, and accessible products. UCD is an iterative design process that considers the needs of potential end users throughout the design process, often involving these users throughout the design process to elicit requirements and evaluate solutions [181]. In addition to the involvement of users, experts in the field the system is designed to operate in may be involved in the design process, often to evaluate designs and systems. The design process tends to encompass four phases.

In the first phase, designers consider the context in which users will use the system. In the second phase, designers seek to identify and define user requirements for the system. In the third phase, designers design and develop potential solutions. In the fourth phase, these potential solutions are tested with potential users, and against the identified requirements. As an iterative process, these steps may be revisited several times to create a system that meets the requirements of its users. This design process ensures that systems meet user needs and wants, and contributes to the design of ethical or empathic systems that respect the users. Due to the sensitive context of technology to be used by bereaved people to express themselves, UCD was a key methodological influence on the research conducted and reported herein, because of its emphasis on and consideration given to users. UCD heavily influenced the methods used in all the studies conducted and reported in this thesis. Study 1 (Chapter 4) sought to elicit user requirements, and indeed identified a series of design considerations for the design of CC technology to support the bereaved. Studies 2 and 4 (Chapters 5 and 7) had users evaluate systems that employed the design considerations, and Study 3 (Chapter 6) had experts share their experiences supporting the bereaved and evaluate the design considerations.

3.2.2 User Experience Design

User Experience (UX) Design makes use of a UCD approach, with the user at the forefront, but more explicitly considers how interaction with the system or product makes the user feel. The goal of UX design is to produce systems that enhance user satisfaction through the creation of systems that are usable, accessible, and pleasurable

to interact with. To create systems that provide a good experience, UX designers consider the context in which the system is to be used, and how best to fulfil user requirements [67]. To achieve this, UX designers consider why users use a product or system, what people can do with the product or system, and how the system supports this.

A good user experience not only ensures people enjoy using the system, or feel capable of doing so, but encourages people to continue using the system based on previous good experiences. User experience of systems is an important consideration in the design of technology to support the bereaved, as bad user experiences may not only inhibit system use, but negatively impact the bereaved user's mental wellbeing. As such, we consider not only the requirements of potential users, but also how they may experience the system. UX design shaped the methods used in Study 4 (Chapter 7) which sought to evaluate the user experience of the system, and whether they felt better having used the system.

3.2.3 Research for Design and Research through Design

Research for design (RfD) and *Research through Design* (RtD) are interconnected approaches to research (see Figure 12 below) , and when used together have the potential to augment each other [58,179]. RfD seeks to elicit information that will inform the design of a product or system. The information gathered from RfD based studies can be used to create a product or system, or to identify user requirements, and develop design guidelines [58,179]. RfD can lead to a greater understanding of systems to be developed and as such inform RtD. RtD makes use of prototypes and the development of design concepts to identify design considerations and evaluate systems [58,179]. RtD can contribute to the development of design guidelines through the evaluation of prototypes, and help generate new insights and ideas which can inform RfD. As such, the work reported in this thesis was influenced by both methodologies (more so RfD) in that it sought to elicit information to develop design guidelines (goals and objectives) for CC systems to support bereaved people through interviews with stakeholders and to inform the selection of the prototypes used to evaluate the impact of the design guidelines.

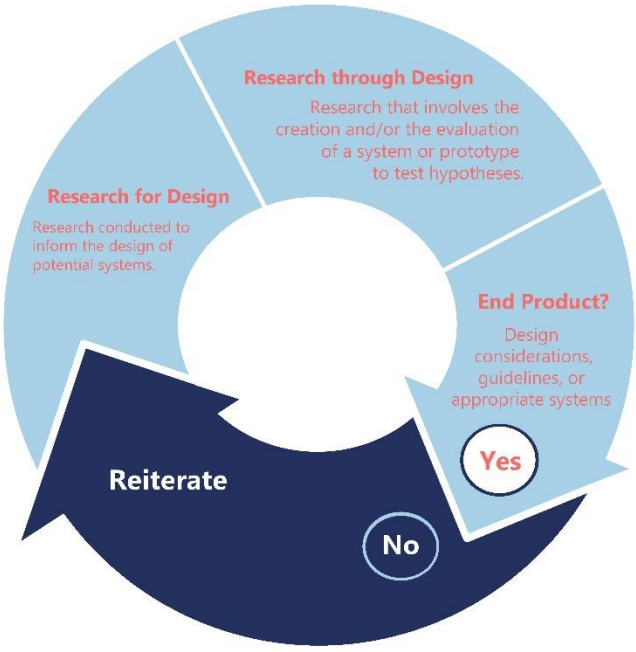


Figure 12: The interconnectedness of RfD and RtD

Study 1 (Chapter 4) was consisted of potential users being interviewed to elicit greater understanding of the context the system would operate in, and to elicit user requirements for said system. This approach was intended to influence what prototype participants would interact with in Studies 2 and 4. Study 3 (Chapter 6) involved the interview of experts (professionals and volunteers who provide support to bereaved people). The interviews sought to gain a greater understanding of the help these experts provide to people, and involved the experts evaluating a series of design considerations generated as a result of Study 1. This approach sought to elicit more information to refine the design considerations from Study 1, and to further influence the prototype to be used in Study 4. Studies 2 and 4 (Chapters 5 and 7) made use of prototype systems to answer research questions and evaluate the design considerations generated in Study 1 and refined in Study 3. Study 2 had participants use a poetry generation system to test the impact co-creative systems that encouraged participation in the creation process, and made use of framing information and sentiment analysis would have on ownership over possessions co-created. Study 4 had bereaved participants make use of a co-creative song creation system to evaluate the design considerations, and to explore their experience of the system. Studies 2 and 4 sought

to evaluate prototype systems in a real-life context, to generate new insights and further refine the design considerations into a series of design goals and objectives.

3.2.4 Research in Sensitive Contexts

Due to the sensitive nature of bereavement, and the ethical approval process required to conduct studies, the researcher implemented measures into the research process to protect the mental and physical wellbeing of participants and the researcher himself. Ethical approval was attained for each study conducted (see Appendix A). Prior to conducting research with the bereaved the researcher completed Scotland's Mental Health First Aid (SMHFA) course[7] offered and run by the NHS. The aims of SMHFA are to[8]:

- Preserve life
- Provide support to prevent mental health problems or crises worsening
- Promote recovery of good mental health
- Provide comfort to those who are experiencing distress
- Promote understanding of mental health issues

The course prepared the researcher for work undertaken in sensitive contexts, and provided guidance on what to say and do in a mental health crisis, how to respond to suicidal ideation and risk, the importance of good listening skills, and a greater understanding of mental health and recovery from mental health issues. As part of the course the researcher was taught the ALGEE action plan, designed to help identify potential mental health issues and provide guidance on how to deal with them. *ALGEE* is an acronym of the 5 steps taught to those who undergo the SMHFA course. Those who undergo the course are taught to:

1. **A**sses the risk of suicide or self-harm

[7] For more information on SMHFA course, see: http://www.smhfa.com/taking-course/what-will-I-learn.aspx

[8] As presented on the SMHFA website, here: http://www.smhfa.com/taking-course/what-will-I-learn.aspx

2. **L**isten non-judgementally
3. **G**ive reassurance and information
4. **E**ncourage people seek appropriate professional help
5. **E**ncourage self-help and other support strategies.

The SMHFA course allowed the researcher to practice the ALGEE action plan in fictional scenarios, and as such the researcher was prepared to use it should the need have arisen in any of the studies reported on in this thesis.

Aside from this, comprehensive information sheets were prepared for each study that emphasised participation was not mandatory and that participants could withdraw from the study at any point (these can be seen in Appendix B, Appendix C, Appendix D and Appendix E). In person, the researcher explained to participants that if they felt uncomfortable at any point the study could be paused, moved along to the next line of enquiry, or that they could withdraw completely. The researcher asked participants if they would like a break during sessions, and made clear that if they wanted a drink or comfort break, the session could be paused. Additionally, the researcher brought individual packets of tissues to each session in case any participants experienced emotional upset, and the contact details for local and national charities that participants could receive help from if needed. These charities included the Samaritans[9], and Cruse Bereavement Scotland[10]. The researcher also had a list of local avenues of support for bereaved people experiencing difficulties, which had been provided by the NHS during the SMHFA course. Thankfully, participants only had to make use of the tissues.

In terms of the researcher's own wellbeing, protocols were put in place to protect the researcher's physical, and mental wellbeing. These protocols were influenced by Moncur's work exploring the emotional wellbeing of researchers [105]. The majority of interviews conducted and reported on in this thesis were carried out at the participant's home, or their place of work. As such, the researcher implemented a protocol whereby he would notify his supervisor or another contact before and after

[9] For more information on the Samaritans, see: https://www.samaritans.org/?nation=scotland

[10] For more information on Cruse Bereavement Scotland, see: http://www.crusescotland.org.uk/

each interview, that they had arrived at the participant's address, and then that they had safely left. In terms of the researcher's mental health, the researcher's supervisors made it clear that should the researcher experience any issues, their doors were open to discuss and debrief. The SMHFA course also prepared the researcher to identify whether they were experiencing any issues and gave the researcher an understanding of what to do to overcome any issues.

3.2.5 Summary of Methodological Influences

In this section, the methodological influences on the research conducted have been introduced and discussed. The research reported on in this thesis places an emphasis on potential users (UCD), and the impact using prototype systems had on these users (UXD). The research, additionally, consulted experts (UCD) in the field in which the systems we seek to inform the design of intend to operate in (bereavement). Bereaved individuals and mental healthcare practitioners were interviewed (RfD + RtD) to develop an understanding of bereavement, bereavement support, and what users want from bereavement support tools. Bereaved, and people not necessarily bereaved were also asked to use prototype systems (RfD + RtD) to refine design considerations into a series of design goals and objectives (UCD) and explore user experiences (UXD). These methodological influences, and the emphasis on potential users and their experiences also influenced the methods employed to gather data which will be discussed next.

3.3 Data Gathering Methods

Data was predominantly qualitative in nature and was gathered through semi-structured interviews (Chapters 604, 6, and 7), and an online survey (Chapter 5). However, quantitative data was also gathered through the online survey (Chapter 5), and to a lesser extent in the final, semi-structured interview-based study (Chapter 7).

3.3.1 Interviews

The interviews we conducted and report on in this thesis were *semi-structured*. Semi-structured interviews are commonly used in healthcare research as they can help interviewees make sense of their experiences and perceptions of health and healthcare [43]. Semi-structured interviews are effective when the researcher understands the topic to be discussed and is aware that data is likely to emerge that they had not

anticipated. Semi-structured interviews are often structured around a basic area that ensures some shared experience between interviewees, from which the researcher can ask more specific questions to probe individual experiences and unforeseen data [43]. This loose structure is supported by an *interview guide*. The interview guide often contains a series of topics, prompts, or questions the researcher is interested in exploring. The interview guide provides some structure to semi-structured interviews but can be deviated from to explore interesting data as it emerges. Deviations from the interview guide can prove fruitful as they let the researcher home in on interesting data expressed by the interviewee [43]. Semi-structured interviews, unlike structured interviews, tend to be one-off interactions between researcher and interviewee, and as such it is important for the researcher to build a rapport with the interviewee. Semi-structured interviews help build this rapport by starting with broad, open-ended questions that are non-threatening, before moving on to more probing and potentially personal questions.

The semi-structured interviews reported on in this thesis were conducted in line with the above. The researcher developed a series of interview guides (see Appendix B, Appendix C, Appendix D and Appendix E) they could turn to if needed during sessions. These interview guides contained a series of questions that the researcher anticipated might prove relevant, and questions could be adapted or not asked. The researcher also made use of a series of probes throughout interview-based studies, which are included in Study 4's interview guide (see Appendix E). The probes were a series of questions that could be asked to elicit further information, such as *"Could you tell me more about that?"* or "*You said the program is a success, how do you define success?"*. This semi-structured approach was well suited to Studies 1 and 4 (Chapters 4 and 7) due to the individual and unique nature of bereavement and grief. Semi-structured interviews allowed the researcher to explore general areas of interest such as reminiscence in Study 1 (Chapter 4) and expression in Study 4 (Chapter 7), and to explore the more personal experiences of interviewees that were not necessarily universal. Semi-structured interviews allowed for the emphasis of the interview to be dictated by the interviewee and supported the collection of data that had not been anticipated. Similarly, the semi-structured approach was well suited to Study 3 (Chapter 6) due to the different approaches and opinions held by mental healthcare practitioners regarding the support they provide to bereaved people. The semi-

structured nature allowed the researcher to delve deeper into each interviewees' approach, and their opinions on what they do that helps their bereaved clients. The semi-structured interviews conducted helped build a rapport between the researcher and interviewees. This rapport was important due to the personal and sensitive nature of grief and bereavement. The interviews were conducted in such a way as to develop a sense of trust in the researcher, and to enable the interviewee to feel comfortable expressing themselves. This was done by beginning interviews with non-threatening questions, participants were first asked demographic questions, and then more general questions related to each study were asked. After these questions were asked, the researcher would then ask more personal questions and probe for additional information. The emphasis on each interviewee's experience and opinion may also have contributed to interviewees feeling listened to and heard – a technique taught in the SMHFA course, and confirmed by one participant (P4) in Study 4 (Chapter 7) who felt the researcher's presence added to the therapeutic value of the system tested in the study. The semi-structured interviews conducted and reported on allowed the researcher to explore a wide range of deeply personal and professional experiences related to a unique and individual topic (bereavement and grief). Each interview conducted and reported on in this thesis was audio-recorded and transcribed manually by the researcher.

3.3.1.1 *Alternatives Considered*

Interviews are amongst the most well-known qualitative research methods. Interviews allow the researcher to get to know the interviewee better, and help develop a working relationship between interviewer and interviewee through which the interviewee feels more comfortable expressing themselves [10,43,140]. Interviews can be structured, unstructured, or semi-structured. Structured interviews are often standardised, narrowly focussed on answering a series of pre-set questions, and produce quantitative data [43]. Structured interviews, largely, do not support deviation from the pre-set questions, and as such do not allow the researcher to probe unforeseen findings adequately [43]. The studies reported on in this thesis are concerned with the individual experiences of bereaved people, and mental healthcare practitioners, and as such the experiences discussed in interviews vary, and the insights between interviews can change. Structured interviews, as a result of this, were not used. Unstructured interviews, on the other hand, offer a high level of flexibility but little replicability.

Unstructured interviews also work best when the interviewer has little understanding, if any, of the topic to be discussed in the interview [43,140]. The focus on grief and bereavement in our studies meant that data gathered from unstructured interviews may not have led to new insights and could have led to interviewees avoiding certain topics.

3.3.2 Online Survey

Study 2 (Chapter 5) was conducted via an online survey. The survey was created using Online surveys[11], and asked participants to co-create digital possessions with a CC system and explore feelings of ownership over a series of different co-created digital possessions. The survey sought to measure the impact that three of the design considerations had on the creation of meaningful possessions. The online survey allowed a large number of people to participate in the study in a relatively short period of time and provided us with qualitative and quantitative data. The survey was distributed using Prolific [128], an online recruitment platform successfully used by several universities and researchers [e.g. 2,15,26].

3.3.3 Warwick-Edinburgh Mental Wellbeing Scale

Study 4 made use of the *Warwick-Edinburgh Mental Wellbeing Scale* (WEMWBS)[12] to collect quantitative data alongside the qualitative data gathered from the semi-structured interviews. WEMWBS was developed in 2016 by researchers from the universities of Warwick and Edinburgh at the behest of NHS Health Scotland. WEMWBS is a widely validated scale that allows researchers to measure the mental wellbeing of individuals who are aged 16 or over and live in the UK [162,165]. The version we used was the 14-item scale that presents individuals with a series of 14 statements and asks them to indicate how often they have experienced the statements on a 5-point Likert scale.

[11] A university provided online survey system, find out more at: https://www.onlinesurveys.ac.uk/

[12] More information on the WEMWBS can be found at it's website here: https://warwick.ac.uk/fac/sci/med/research/platform/wemwbs/

3.4 Data Analysis Methods

Qualitative and quantitative data were gathered by the methods described above. Qualitative data included interview transcripts and open-ended survey responses. Quantitative data included Likert scale data from the survey, and the WEMWBS results. The qualitative data was analysed using *thematic analysis* (TA), and the quantitative data was analysed through a series of statistical analysis tests. Each of these methods will be discussed in turn.

3.4.1 Thematic Analysis

TA is a commonly used method to analyse qualitative data, and is described by Braun and Clarke as a *"method for identifying, analysing and reporting patterns (themes) within data"* [2, p79]. TA is a flexible method, and researchers are encouraged to use it as an iterative process. TA is comprised of five main steps: (1) Familiarising yourself with the data; (2) Coding; (3) Identifying Themes; (4) Reviewing Themes; and, (5) Naming Themes. The researcher employed this approach to the research reported on in this thesis, and often revisited steps. The steps are described below.

Step 1, Familiarise yourself with the data: To familiarise themselves with the data the researcher listened to the recording of each interview in its entirety, and took notes of data that stood out. The researcher then transcribed each interview and anonymised it by removing or substituting names or other identifying information mentioned by participants. Once the interviews were transcribed the researcher read through each transcript and noted down initial ideas.

Step 2, Code the Data: The interview transcripts were imported into qualitative analysis software (NVivo) provided by the university. The researcher then went through each interview individually and began to highlight and assign a code to interesting and relevant quotes. The researcher highlighted everything they thought may be relevant at this stage and included contextual information within the data coded.

Step 3, Search for Themes in the Data: The researcher, at this stage, reviewed the codes generated in the previous step and developed them into potential themes and sub-themes. The researcher included coded data in all themes and sub-themes it could

belong to but sought to minimise overlap. The themes developed in this stage were often broad, and overlapped

Step 4, Review the Themes: The researcher then reviewed the coded data to ensure it was coded in the appropriate theme. Once this was done, the researcher then reviewed the themes, and reorganised them to minimise overlap and to ensure the themes reflected the data. The researcher, at this stage, went back and re-coded the data to ensure the appropriate data was coded and in the correct theme, and then refined the themes again (if possible), which were reviewed to ensure the appropriate data was coded and organised in the correct theme. This was often done several times to ensure the data was properly analysed and that there was not unnecessary overlap between themes.

Step 5, Define and Name the Themes: The researcher carried out this step throughout the above process. Whenever a theme was identified the researcher would give it an appropriate name and definition.

3.4.2 Statistical Analysis

Quantitative data was analysed using a series of statistical analysis tests, using SPSS – quantitative analysis software. Most of the quantitative data collected was ordinal data and as such normality tests were conducted to test whether the data was normally distributed [49]. The majority of data was not normally distributed and as such a series of non-parametric tests were carried out [49,94,174]. The data that was normally distributed was analysed using parametric tests [49]. The results of these tests were reported using p value corrections. The normality tests, non-parametric tests, parametric tests, and significance corrections will each be discussed in turn.

3.4.2.1 *Normality Tests*

Normality tests were conducted to determine whether data collected was normally distributed. The results of these tests indicated whether parametric or non-parametric tests should be used when analysing the data. The Shapiro-Wilk test for normality was used in Studies 2 and 4 (Chapters 5 and 7) as it is more appropriate for small sample sizes. The results of the Shapiro-Wilk test in Study 2 indicated non-parametric tests should be carried out on the data collected, and in Study 3 indicated parametric tests could be used on the data collected.

3.4.2.2 *Non-parametric tests*

Non-parametric tests provide a more rigorous way to analyse data that does not meet the assumptions required for parametric tests. Chief amongst these assumptions is that to be analysed by parametric tests data should be normally distributed. The results of the normality tests we ran in Study 2 (Chapter 5) indicated our data was not normally distributed, and as such was analysed using non-parametric tests. A Friedman test was conducted to determine whether there was a significant difference in the data compared, and a Wilcoxon Signed Rank Test was employed to further investigate between which data there was a significant difference. Kruskal-Wallis tests were used to investigate whether age or gender significantly influenced the data. Data not normally distributed from Study 4 (Chapter 7) was likewise analysed using Wilcoxon Signed Rank Tests.

3.4.2.3 *Parametric tests*

Parametric tests assume the data to be analysed is normally distributed and can have more *statistical power* than non-parametric tests. The results of normality tests we ran in Study 4 (Chapter 7) indicated some of our data was normally distributed, and as such we analysed it using parametric tests. We chose to use parametric tests for the normally distributed data because parametric tests often have a higher statistical power than non-parametric tests, which means they are less likely to result in false positives or negatives. An Independent T-test was used in Study 4 (Chapter 7) to investigate whether age influenced the data gathered.

3.4.2.4 *Significance Corrections*

Two different methods of significance correction were used. The False Discovery Rate (FDR) was used in Study 2 (Chapter 5), and Bonferroni corrections were used in Study 4 (Chapter 7). FDR was used in Study 2 due to the multiple comparisons made between data, and the small sample size. FDR reduced the likelihood of the tests we ran making type 1 errors (false positives) and retained the power to identify significant differences whilst avoiding type 2 errors (false negatives) [9,112,113]. FDR adjusted p values were calculated by dividing the total number of hypotheses tested by the rank of each p value and by multiplying the original p value by this number. Effect size was calculated using the methods outlined in Olenjnik & Algina [126]. Bonferroni

corrections were used on the data analysed in Study 4 (Chapter 7) due to the statistical power of parametric tests, and the small number of comparisons made.

3.5 Summary

This chapter has presented the methodologies that have influenced the studies reported on in this thesis, and the methods used to conduct the studies and the rationale behind their use (see Table 1).

	Research Aim	**Methodology**	**Methods**
Study 1 (Chapter 4)	Identify design considerations for CC bereavement support tools.	UCD UXD RfD + RtD Research in Sensitive Contexts	Semi-structured interviews Thematic Analysis
Study 2 (Chapter 5)	Evaluate 3 of the design considerations from Study 1, and the effect they have on the creation of meaningful possessions.	UCD UXD RfD + RtD	Online Survey Statistical Analysis Thematic Analysis
Study 3 (Chapter 6)	Refine design considerations from Study 1 by interviewing mental health care practitioners and having them evaluate the considerations.	UCD RfD + RtD	Semi-structured interviews Thematic Analysis
Study 4 (Chapter 7)	Evaluate the use of a CC system in a bereavement context.	UCD UXD RfD + RtD Research in Sensitive Contexts	Semi-structured interviews Thematic analysis WEMWBS Statistical analysis

Table 1: Overview of Studies, Methodologies, and Methods

The proceeding chapters will present the studies in which these methodologies and methods were employed to collect, analyse, and report on the data collected.

Chapter 4

4 Study 1: Reminiscence practices amongst bereaved individuals

4.1 Introduction

Technology is largely under-utilised to support the bereaved. In recent years websites resembling graveyards, Facebook memorial pages and fora dedicated to bereavement have been successfully employed [18,62,144,148]. However, most of the technology that people use to support them in bereavement either was not designed to support the bereaved or was designed with little reference to current work on grief and bereavement. Human Computer Interaction (HCI) researchers, alongside those interested in death in a digital age, have begun to explore the role technology can play at the end of life. Despite this, much of the work focuses on pre-existing technologies or fails to explore emerging technologies such as artificial intelligence (AI). Recent work has contributed theoretically to the design of objects that support memorialization, or reminiscence through the creation of frameworks and the provision of guidelines, recommendations, and discussion of design opportunities [46,54,107,123], and practically to the creation and assessment of these objects [106]. Despite this, researchers have largely overlooked the potential of AI, especially computational creativity (CC), to add further depth to the systems they propose. CC is a growing field of multi-disciplinary researchers whose goal is to develop fully or semi-autonomous software systems which can generate artefacts that - if a human had produced them - would be regarded as creative. These include collaborative, co-creative systems that involve the user in the creation process and have been developed for a range of domains, including generation of poetry, stories, visual art and music composition [11].

In this study we explored what should be considered when designing CC bereavement support tools. We posit this exploration is important due to the universality of bereavement, the negative impact bereavement can have on a person's mental and physical health, and the varied efficacy of psychological interventions. Additionally, recent work carried out by Sas et al [149] has suggested interactive technology that allows people to craft things, digitally, related to their bereavement warrants further exploration as a potential means of support, as could a system designed with art therapy in mind. The aim of this study was to inform the design of CC systems that support bereaved people. To do so, the study explored two key areas. Firstly, we sought to develop a greater understanding of current reminiscence practices amongst bereaved people, especially regarding the possessions they interact with when reminiscing. Participants shared stories about the deceased, and about their possessions, and the researcher explored what possessions participants interacted with, their interactions with these possessions, and how possessions and interactions with them may differ dependant on whether the person they relate to is alive or deceased. This helped the researcher develop a greater understanding of each individual's bereavement, and their reminiscence practices. Secondly, we sought to explore participant receptiveness to the notion of CC systems being deployed in a bereavement context to support bereaved individuals. Through this the researcher gained an understanding of what participants would accept or wanted, and what participants feared or did not want. These explorations were done through semi-structured interviews with bereaved people who made use of physical and digital possessions to aid reminiscence. The study sought to achieve the above aim to elicit user informed design considerations.

RQ1: *How can CC systems be designed to facilitate current reminiscence practices of the bereaved?*

4.2 Study Setup

4.2.1 Procedure

Participants took part in a single semi-structured interview with the researcher each of which was audio recorded for transcription. These interviews were run in a similar way to other related work that explored valued possessions [80,124,136], and

interviews were conducted in a similar way to those described by Elsden et al [46]. The interviews conducted were divided into three sections (see Figure 13 for a study flow diagram).

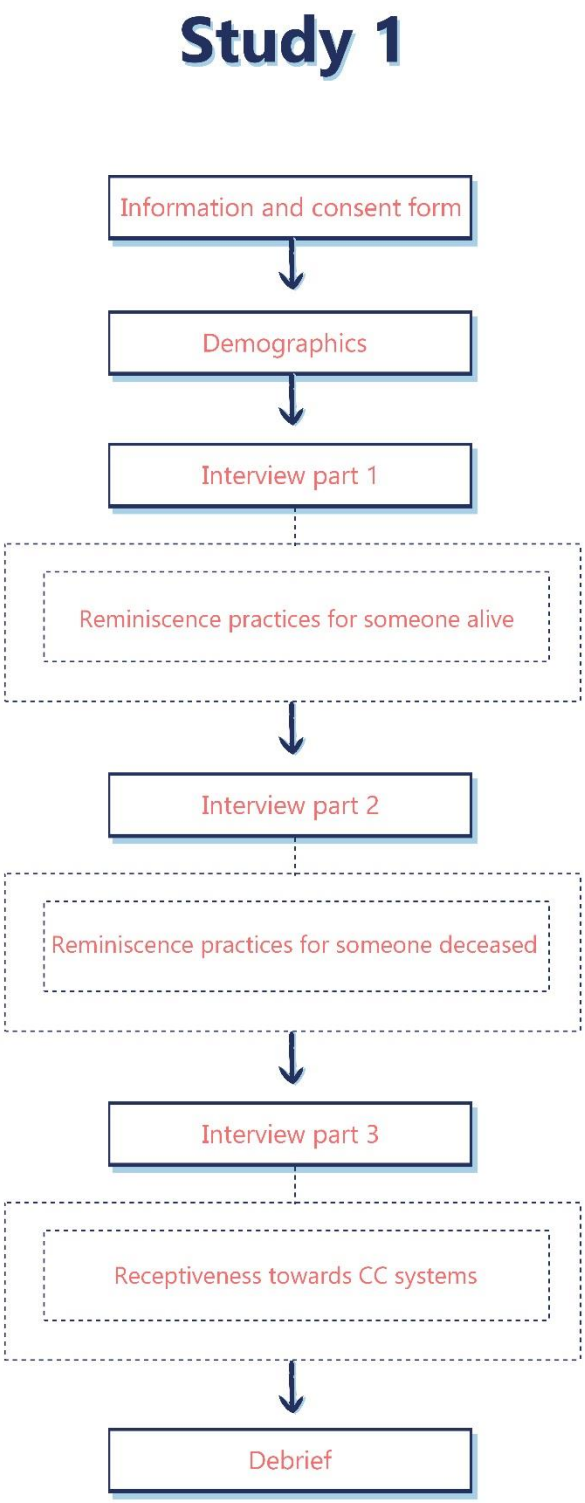


Figure 13: Study 1 Study Flow

4.2.1.1 *Semi-Structured Interview*

The first section of the interview sought to gather information about how participants reminisced about people or memories with people who were currently alive. Participants were asked to retrieve (if possible) or describe possessions they had that related to the person they elected to speak about, and were asked in an open-ended way about the possessions, and interactions with them. As prompts, participants were asked to describe how and why they interacted with each possession, how they felt doing so, how often they interacted with the possession, and to explore any differences between physical and digital possessions they spoke about. This process eased participants into the interview process, and gave them an idea of what to expect when they would be asked to discuss reminiscence related to the person they had lost.

The second section sought to gather similar information as the first but related to someone deceased. Participants were asked, again, to retrieve (if possible) or describe possessions related to someone deceased, and were asked to explore each possession, and how it made them feel. Similar prompts to those used in the first section were used, with the addition which asked participants to explore whether they viewed these possessions differently to those discussed in the first section.

The third section asked participants to consider and discuss how they felt about possessions outliving their owners, and invited participants to explore their receptiveness to the use of CC systems in a bereavement context to support the bereaved. Discussions on possessions outliving their owners were undertaken to gauge whether participants would be receptive to these possessions being used as input for CC systems to generate new possessions. To have these discussions the researcher introduced participants to the concept of CC by describing CC systems as *"creative computers", "computers that can create some form of art such as poetry, or paintings, that if a human had written or painted them would be considered creative."* The researcher then provided verbal descriptions of two example CC systems to give participants an idea of what these systems could look like. The researcher described a poetry generator, similar to Misztal and Indurkhya's PoEmo [103], that could create poems reflective of how the user felt. The system described had users write about how they were feeling, or about a memory, that would be used as the inspiration of the poem. The system would then analyse the user's text and try to calculate the emotions present and create a poem reflective of this. The second system described by the

researcher was an image generation system, similar to Colton's Painting Fool [28], which is a more autonomous system that uses already existent text to generate paintings. The system does so by analysing newspaper articles for emotional value and content, and then creates an image based on these. These examples were chosen as they are easy to understand and undertake two common forms of creativity, writing and painting. It was explained to participants that these systems could use pre-existing possessions such as emails or letters as input to create something new, or that users could purposefully create something to be used as input such as text written that expresses how they feel or reminisces about the deceased. Participants were encouraged to ask questions if they had them but thanks to the example systems described all participants indicated they understood the concept. Some participants went on to remark on similarities between these systems and an episode of a TV series (Black Mirror) in which a woman bereaved of her boyfriend uses AI and robotics to imitate her deceased boyfriend[13].

Between each section participants were asked if they would like a break, or whether they would like a drink or to go to the toilet. This was to ensure participants felt comfortable, and that if they were experiencing difficulties, they could avoid any potential *"awkwardness"* or *"discomfort"* that could result from asking for a break. After the third and final section, participants were thanked, and asked whether they would like to be kept abreast of the study regarding publications, how they felt having taken part, and whether they would be interested in participating in future studies.

4.2.1.2 *Study Setting*

Semi-structured interviews were conducted in private, on a one to one basis. Interviews took place at participants' homes to increase the likelihood participants would have access to their possessions. When a home interview was not possible, interviews were conducted in a private meeting room at the university, or through audio and video conferencing software. Two participants lacked access to the possessions they spoke about during the interview, whilst six had access to some but not all of their possessions.

[13] For more information on the episode see: https://en.wikipedia.org/wiki/Be_Right_Back

4.2.2 Participants

For inclusion in the study participants had to be 18 – 33 years old, speak English, live in Scotland, and, have been bereaved for between 6 months and 7 years. 18 – 33 year olds were chosen in an attempt to ensure participants used technology frequently. The bereavement criteria sought to involve participants who were not newly bereaved - as they were perceived to be too vulnerable from an ethical perspective - yet whose bereavement was recent enough that the deceased was likely to have left digital as well as physical possessions behind. No exclusion criteria were set for gender, possessions, the subject of reminiscence, or the cause of death. Our participants mostly spoke about family members who had died of natural causes. Most of the deceased referred to were elderly and had not interacted with technology frequently - only two participants elected to speak about someone who frequently interacted with technology. One participant spoke about a friend that died - this was also the only subject who did not die of natural causes. The perspective of the data gathered, and the subsequent design considerations identified have been influenced by the demographics of participants (see Table 2).

Participant Number	Age	Gender	Alive subject of reminiscence	Deceased subject of reminiscence	Time from deceased death to interview
1	26	Female	Partner	Grandmother	7 months
2	23	Female	Partner	Grandmother	11 months
3	20	Male	Mother	Grandmother	6 years
4	28	Female	Mother	Grandmother	5 years
5	23	Female	Sister	Mother	1 year 7 months
6	23	Male	Grandmother	Grandmother	7 years
7	19	Male	Brother	Grandmother	6 years
8	18	Female	Mother	Grandmother	3 years
9	26	Female	Friend	Grandmother	11 months
10	31	Male	Brother	Father	1 year 6 months
11	22	Male	Mother	Grandmother	1 year 8 months
12	33	Female	Mother	Grandmother	6 months
13	27	Female	Partner	Friend	1 year 8 months

Table 2: Study 1 Demographics

Thirteen participants were recruited (8 female, 5 male) through a poster campaign, online newsletters and social media sites, and a study website (details are provided in Table 2). Posters were pinned up in various locations throughout Dundee, Edinburgh, and Aberdeen including in university buildings, libraries, coffee shops, music shops,

community support sites, and churches. University newsletters and social networking websites were also used to share the poster, on which there was a link and QR code to a website that contained all relevant information for the study (including information sheets, consent forms, and a contact form to register interest). Likely as a result of these recruitment methods participants were predominantly students with an average age of 24.5 who had mostly been bereaved of an older relative (i.e. grandparent). The time since bereavement occurred ranged from 1 to 7 years with an average of 2.79 years, and all participants indicated they were close or extremely close to the people they spoke about. Participants were anonymized via the assignment of acronyms (P1 – P13). A small introduction to each participant, and the possessions they spoke of is presented below:

P1 was a 26-year-old, non-religious (atheist) female who had or was currently pursuing a Doctorate (PhD). P1 elected to discuss reminiscence practices and possessions related to their partner who is alive, and their grandmother who is deceased. P1 indicated they last spoke to their partner *"in person, within the last hour",* and that their grandmother had died 7 months prior to their participation in the study. P1, on a scale of 1 to 5 (1 being not close at all, and 5 being very close) scored their closeness to their partner a 5, and to their grandmother a 4. Their grandmother died 7 months prior to their participation in the study. The possessions related to their partner included physical and digital possessions. Physical possessions mentioned or shown by P1 included photographs, artwork including drawings P1 did for her partner, books, toys, games, clothes, shared possessions such as bedding, the flat, and some books, a hat purchased at a festival with him, and some of his possessions that P1 used. Digital possessions mentioned or shown by P1 included digital photographs stored on a variety of platforms (phone, pc, and social media), games and in game purchases, messages and archives on a variety of platforms (Snapchat, WhatsApp, Facebook, SMS messages, and in game messages), and a shared Netflix account. The possessions related to their grandmother included physical and digital possessions, but those P1 had access to were mainly digital as the physical possessions had been left at their family home in another country. Physical possessions included a handwritten birthday and congratulatory card and presents given by the deceased to P1 including hand cream and a necklace. Digital possessions consisted of digital photographs, and the

contact details on P1's phone, and on Skype, for her grandparents which had both grandparents' names in it.

P2 was a 23-year-old, non-religious female who had or was currently pursuing a postgraduate Master of Science degree. P2 elected to discuss reminiscence practices and possessions related to their partner who is alive, and their grandmother who is deceased. P2 indicated they last spoke to their boyfriend *"within the last hour"*, and that their grandmother had died 11 months prior to their participation in the study. P2, on a scale of 1 to 5 (1 being not close at all, and 5 being very close) scored their closeness to their partner a 5, and to their grandmother a 4. The possessions related to their partner included physical and digital possessions. Physical possessions mentioned or shown by P2 included jewellery, tickets from outings they had gone on together, and photographs. Digital possessions mentioned or shown by P2 included digital photographs. The possessions related to their grandmother were predominantly physical. Physical possessions included the funeral service booklet from the deceased's funeral, handwritten birthday and congratulatory cards, and photographs. Digital possessions included digital photographs shared with family across social media websites.

P3 was a 20-year-old, non-religious male who had or was currently pursuing an undergraduate degree. P3 elected to discuss reminiscence practices and possessions related to their mother who is alive, and their grandmother who is deceased. P3 indicated they last spoke to their mother *"within the last week, using technology",* and that their grandmother had died 6 years prior to their participation in the study. P3, on a scale of 1 to 5 (1 being not close at all, and 5 being very close) scored their closeness to their mother a 5, and to their grandmother a 4. The possessions related to their mother included physical and digital possessions. Physical possessions mentioned or shown by P3 included books and presents given to them by their mother (and father). Digital possessions mentioned or shown by P3 included content on social media websites, specifically posts about shared interests. The possessions related to their grandmother were physical. Physical possessions included a lamp that had once belonged to their grandmother, and a book gifted to them by their grandmother. P3 did mentioned there were digital photographs of their grandmother but attributed their ownership to their mother.

P4 was a 28-year-old, Christian female who had or was currently pursuing a Doctorate (PhD). P4 elected to discuss reminiscence practices and possessions related to their mother who is alive, and their grandmother who is deceased. P4 indicated they last spoke to their mother on the phone on the day of the study, and that their grandmother had died 5 years prior to their participation in the study. P4, on a scale of 1 to 5 (1 being not close at all, and 5 being very close) scored their closeness to their mother a 5, and to their grandmother a 4. The possessions related to their mother included physical and digital possessions. Physical possessions mentioned or shown by P4 included jewellery P4 was given by their mother such as rings and earrings, clothes, and books. Digital possessions mentioned or shown by P4 included digital photographs on the participant's phone, one of which P4 used as the background image for their home screen or screen saver on their phone. The possessions related to their grandmother were solely digital. Digital possessions mentioned were photographs stored on a broken laptop, and on another hard drive.

P5 was a 23-year-old, non-religious female who had or was currently pursuing an undergraduate degree. P5 elected to discuss reminiscence practices and possessions related to their sister who is alive, and their mother who is deceased. P5 indicated they last spoke to their sister the day before on the phone, and that their mother had died 1 year and 7 months prior to their participation in the study. P5, on a scale of 1 to 5 (1 being not close at all, and 5 being very close) scored their closeness to their sister a 5, and to their mother a 5. The possessions related to their sister included physical and digital possessions. Physical possessions mentioned or shown by P5 included photographs, books, and handwritten letters. Digital possessions mentioned or shown by P5 included photographs, and chat logs of previous messages. The possessions related to their mother included physical and digital possessions. Physical possessions included photographs, handwritten letters and cards, and a kindle. Digital possessions included photographs, old Facebook messages, call log, kindle books, and music in playlists on Spotify.

P6 was a 23-year-old, non-religious male who had or was currently pursuing an undergraduate degree. P6 elected to discuss reminiscence practices and possessions related to their grandmother who is alive, and their grandfather who is deceased. P6 indicated they last spoke to their grandmother 2 weeks prior to the study, and that their grandfather had died 7 years prior to their participation in the study. P6, on a scale of

1 to 5 (1 being not close at all, and 5 being very close) scored their closeness to their grandmother a 3, and to their grandfather a 2. The possessions related to their grandmother included physical and digital possessions. Physical possessions mentioned or shown by P6 included a bible gifted to them by their grandmother, and photographs. Digital possessions mentioned or shown by P6 included photographs, and social media interactions. The possessions related to their grandfather were physical. Physical possessions included an oxygen tank their grandfather made use of, and a jar that once belonged to their grandfather that used for sweets.

P7 was a 19-year-old, non-religious male who had or was currently pursuing an undergraduate degree. P7 elected to discuss reminiscence practices and possessions related to their brother who is alive, and their grandmother who is deceased. P7 indicated they last spoke to their brother on the morning of the study via text message, and that their grandmother had died 6 years prior to their participation in the study. P7, on a scale of 1 to 5 (1 being not close at all, and 5 being very close) scored their closeness to their brother a 4, and to their grandmother a 4. The possessions related to their brother included physical and digital possessions. Physical possessions mentioned or shown by P7 included official documentation such as passports and birth certificates. Digital possessions mentioned or shown by P7 included chat logs, and stories sent to P7 by their brother, such as scripts. The possessions related to their grandmother were physical. Physical possessions included furniture, bedsheets, lampshades, and an equaliser for an old radio or turntable.

P8 was an 18-year-old, Christian female who had or was currently pursuing a HND at college. P8 elected to discuss reminiscence practices and possessions related to their mother who is alive, and their grandmother who is deceased. P8 indicated they last spoke to their mother in person half an hour before the study, and that their grandmother had died 3 years prior to their participation in the study. P8, on a scale of 1 to 5 (1 being not close at all, and 5 being very close) scored their closeness to their other a 5, and to their grandmother a 5. The possessions related to their mother included physical and digital possessions. Physical possessions mentioned or shown by P8 included pottery P8 and their mother made together, and a ring given to P8 by her mother. Digital possessions mentioned or shown by P8 included chat logs of online or SMS conversations, and photographs. The possessions related to their grandmother were physical. Physical possessions included a cardigan knitted by a relative that P8

inherited from their grandmother, paintings their grandmother did, art supplies inherited from or gifted by their grandmother, and other presents such as three teddy bears.

P9 was a 26-year-old, non-religious female who had or was currently pursuing a postgraduate degree. P9 elected to discuss reminiscence practices and possessions related to a friend who is alive, and their grandmother who is deceased. P9 indicated they last spoke to their friend on the morning of the study through Facebook messenger, and that their grandmother had died 11 months prior to their participation in the study. P9, on a scale of 1 to 5 (1 being not close at all, and 5 being very close) scored their closeness to their friend a 5, and to their grandmother a 5. The possessions related to their friend included physical and digital possessions. Physical possessions mentioned or shown by P9 included photographs, handwritten letters, a t-shirt made for P9 by the friend, and gifts such as jewellery, and items from their hometown such as foodstuff. Digital possessions mentioned or shown by P9 included social media archives, and photographs. The possessions related to their grandmother included physical and digital possessions. Physical possessions included birthday and Christmas cards, handwritten letters, jewellery such as a watch and ring, items of clothing such as a coat, and photographs and some old film tapes. Digital possessions included photographs on P9's phone.

P10 was a 3-1year-old, non-religious male who had or was currently pursuing an undergraduate degree. P10 elected to discuss reminiscence practices and possessions related to their brother who is alive, and their father who is deceased. P10 indicated they last spoke to their brother the week before the study through text message, and that their father had died about 1 year and 6 months years prior to their participation in the study. P10, on a scale of 1 to 5 (1 being not close at all, and 5 being very close) scored their closeness to their brother a 5, and to their father a 3. The possessions related to their brother included physical and digital possessions. Physical possessions mentioned or shown by P10 included board games and Xbox games, and items purchased for P10 by their brother such as toiletries or cosmetics. Digital possessions mentioned or shown by P10 included Xbox games. The possessions related to their father were physical. Physical possessions included an estate inherited from their father which included land, offices, and a house, a car, and a Rolex watch.

P11 was a 22-year-old, Christian male who had or was currently pursuing an undergraduate degree. P11 elected to discuss reminiscence practices and possessions related to their mother who is alive, and their grandmother who is deceased. P11 indicated they last spoke to their mother about 25 minutes prior to the study via text message, and that their grandmother had died 1 year and 8 months prior to their participation in the study. P11, on a scale of 1 to 5 (1 being not close at all, and 5 being very close) scored their closeness to their mother a 4, and to their grandmother a 4. The possessions related to their mother included physical and digital possessions. Physical possessions mentioned or shown by P11 included photographs and university books. Digital possessions mentioned or shown by P11 included photographs and text histories. The possessions related to their grandmother included physical and digital possessions. Physical possessions included furniture and other items around P11's house, photographs, and paintings. Digital possessions included photographs.

P12 was a 33-year-old, Christian female who had or was currently pursuing a postgraduate degree. P12 elected to discuss reminiscence practices and possessions related to their mother who is alive, and their grandmother who is deceased. P12 indicated they last spoke to their mother the day before the study on the phone, and that their grandmother had died 6 months prior to their participation in the study. P12, on a scale of 1 to 5 (1 being not close at all, and 5 being very close) scored their closeness to their mother a 5, and to their grandmother a 3. The possessions related to their mother included physical and digital possessions. Physical possessions mentioned or shown by P12 included a green jumper, an angel statue, hanging decorations, a gold ring, books, pictures, decorative signage, Christmas decorations inherited from her mum, and a clock. Digital possessions mentioned or shown by P12 included photographs, a large collection of saved emails, and some voicemail messages. The possessions related to their grandmother included physical and digital possessions. Physical possessions included a ring inherited from their grandmother, and furniture such as a dresser, crockery, and teapots. Digital possessions included photographs.

P13 was a 27-year-old, non-religious female who had or was currently pursuing a doctorate (PhD). P13 elected to discuss reminiscence practices and possessions related to their partner who is alive, and a friend who is deceased. P13 indicated they last spoke to their partner on the day of the study, and that their friend had died 1 year and

8 months prior to their participation in the study. P13, on a scale of 1 to 5 (1 being not close at all, and 5 being very close) scored their closeness to their partner a 5, and to their friend a 2. The possessions related to their partner included physical and digital possessions. Physical possessions mentioned or shown by P13 included a scrapbook in which was kept mementos from throughout their relationship, shared possessions such as a camera, and appliances such as a TV and PlayStation. Digital possessions mentioned or shown by P13 included shared accounts such as a Netflix account, and a Google Play account on which P13's partner made her a music playlist, photographs stored on google photos and various social media accounts, and audio recordings P13 has made for her partner, or that they have made together. The possessions related to P13's friend were digital, although P13 had access to physical possessions related to the friend. Digital possessions included interaction histories on social media accounts, and photographs. Physical possessions P13 had access to but did not view as her possession but her partner's, were VHS tapes.

4.2.3 Analysis

Thematic Analysis as described in Chapter 3 was employed to analyse the interview transcripts. This process consisted of the researcher: (1) familiarizing themselves with the data by transcribing the interviews and reading and re-reading the transcriptions and taking notes on initial ideas; (2) Generating as many initial codes and potential themes as possible that identified interesting aspects of the data, and collating the data into the appropriate codes; (3) Searching for themes across the initial codes and sorting the codes into their potential themes or sub-themes; (4) Reviewing the coded data and the themes iteratively to refine and reorganise the themes and sub-themes; and, (5) Defining and naming the themes to facilitate the creation of an overall narrative within the data. NVivo, qualitative analysis software, was used to do this.

4.3 Results

We found valued possession can take many forms (physical and digital), possessions can be imbued with a sense of history through inheritance and history, that people oscillate between interacting with feelings and possessions related to bereavement and avoiding them, that storytelling should be supported, and that bereavement technology should support asymmetric relationships and reflection on these.

Five key themes surfaced from the data: (1) possessions, and their properties (2) interactions with possessions, (3) privacy and permissions, (4) contrasts in interactions with, and properties of possessions, and (5) factors that influence receptiveness towards CC systems. We discuss each in turn here.

4.3.1 Possessions and their properties

Every participant reported having both physical and digital possessions related to someone alive or the deceased. Physical possessions identified included photographs, letters, games, clothing, books, and jewellery. Digital possessions included photographs, emails and other text-based archives, in game gifts, playlists, eBooks, and shared accounts such as Netflix, and Google Photos. Possessions related to someone alive were mainly digital, whilst possession relating to the deceased for all, but two participants were mainly physical: these individuals were older and had not used technology much, if at all.

Every participant reported that they favoured physical possessions for someone alive. These possessions were valued more mainly due to their tangibility. Participants could touch, or smell these possessions, and possessions could degrade over time or through interaction. Participants reported degradation added value to the possessions but is something they fear. P1 described degradation as: *"…what makes the possession more precious, that you can lose it, or it be destroyed. Also, what makes it scary, but mean more."*

The ease with which physical possession are imbued with a history is another reason participants favour them. Physical possessions have been around longer than their digital counterparts and can physically be passed from generation to generation. As P3 put it when describing a treasured copy of The Lord of the Rings book: *"It's the sense of handed down, handing it down the family. Family possessions and things like that. Other than that, it's just like any other copy of Lord of the Rings, just with minor differences."*

Participants also reported the personalisation inherent in handwriting, and drawings were another reason they preferred physical possessions. They felt the person had to go to greater lengths to create and pass on these possessions. Describing letters from her mother, P5 said:

"I think, it's a bit more personal because it's her hand writing… I'm really worried about them…If something happened to this flat and then they're gone, y'know? I don't have a backup. If it was an email or something, then you'd always have it there."

The lack of space required by digital possessions, and the level of access they offered was a positive. Participants liked the ability to access their possessions wherever they were, and the ability to store many possessions easily. The latter of which P12 illustrated: *"I'm just glad all the emails aren't physical because I'd never have all the space for them."*

For possessions related to the deceased the all of the above was true for all but two participants. Of these two participants one only had digital possessions, and as such valued those without the ability for comparison. The other had both physical and digital possessions and preferred the digital as they were harder to lose (easier to backup), and as they interacted with the person, they lost through social media looking back on those messages made them feel closer to the person.

4.3.2 Interactions with possessions

Participants interacted with possessions related to someone alive for a range of reasons: Out of necessity due to them having put pictures on walls in their home or as their screensaver on their phone, when they wanted to remember something, when something made them think of the person or event the possession related to, whilst reminiscing or feeling emotional, or when feeling stressed: like P13:

"I suppose remembering stuff could lead me on to looking at my Instagram account...I suppose it depends on how I'm feeling. If I'm feeling melancholic, I might have a look through, yeah. I suppose feelings and just remembering stuff to begin with might make me have a look through."

Or when feeling stressed like P9: *"That's the one* [bracelet] *I wear every day, if I don't have it, I'm looking for it whenever I'm stressed, because it's a gift."*

These interactions were frequent and not seen as special. P5 said of letters she had received from her sister: *"I don't really think much about the* [possessions] *ones with my sisters. Just y'know she writes a funny letter, it's just kind of nice to look at."*

Interactions with possessions related to the deceased differed. Participants interacted with possessions more in the immediate aftermath of the person's death, the frequency of these interactions would gradually decline, and interactions became less frequent but more meaningful (compared to interactions with possessions related to someone alive) as participants came to terms with their loss:

> *"It took me a long time to come to terms with it so when she first died, I did spend a lot of time looking back at photos and things, but now I still do obviously look back but not as much." (P11)*

> *"When she passed away it wasn't expected, and it was quite out of the blue. I was constantly looking at them, for example with the cardigan, because it smelled of her, I was constantly smelling it. And now obviously as you adapt to the fact they're not there anymore you do tend to maybe not look at them anymore, or interact with them anymore, but they're still there if you need to go back to them." (P8)*

Interactions with these possessions were brought about mainly by anniversaries, special occasions, or necessity (e.g. moving to a new house). Interactions with possessions related to someone alive, like with the deceased, brought to mind happy memories without the sense of longing those related to the deceased also brought. Interactions with possessions related to the deceased were bittersweet:

> *"Not saying the ones with my grandma make me sad, it's just more mourning the loss of her and wishing she was here to spend that time with me. Happy thoughts as well, like they're all positive memories that I have with my grandma that I associate with the photographs, and letter, y'know everything's nice. It's just missing her. It brings home that, and the thought you won't see her again, or create new memories." (P1)*

4.3.3 Privacy and Permissions

Participants (n=6) were concerned about their privacy and that of the deceased. Some participants felt digital possessions afforded them a level of privacy in public that physical possessions do not:

"The phone is there with me, the easiest, if I'm out in public can't exactly be carrying a teddy bear. It's quite nice and private, people don't really know what you're looking at. It keeps it personal, between you and the person." (P1)

Despite this, participants were worried about the privacy of possessions available online, and who could access them, P1 stated the ability to lose physical possessions: *"Makes me want to digitise everything, it's what my mum and dad have started doing. But then I'm scared it's going to be out there for everyone. It's not a win win, is it?"* These concerns were most strongly felt in relation to the use of possessions related to the deceased in the creation of new possessions to help memorialise or continue bonds, both in regard to the privacy of the deceased, and of the bereaved. Participants were worried about who could use what possessions, who could access the possessions, and whether some things should be shared:

"It's all about context I suppose. If it is a shared thing then I definitely think that it should be considered whether that person would have thought it was personal. If it is a personal thing then whatever you have access to you obviously, there is a reason why you have access to it, so it would be fine." (P13)

4.3.4 Contrasts in interactions with and properties of possessions

This theme is comprised of two subthemes: Contrasts between the digital and physical possessions; and contrasts between possessions related to someone alive, and the deceased.

4.3.4.1 *Contrasts between digital and physical possessions*

Participants preferred physical possessions but interacted with digital possessions more, especially in relation to someone that is still alive, or someone who had a digital presence but is now deceased. P1 commented on the contradiction between preference and reality: *"It's hard, because I would have always said physical. But when you think about it, I think I rely a lot more on the digital."*

This was down to two key things. Firstly, participants had easier access to considerably more digital possessions on the go than they ever could physical possessions. They

carry around thousands of photographs, videos, messages, and access them wherever they are. Secondly, by interacting with these possessions through what one participant termed a *"viewport"* (mobile phone, computer, etc.) their interaction is given a level of privacy not offered by a physical possession. People know you are looking at a phone, but they don't know what it is on the phone you are looking at. Despite this, physical possessions are valued more and interactions with them are seen as more impactful for the person as well as the possession. This is in part due to their infrequent interactions with the possession:

> *"I feel that if it is physical it is more valuable. I wouldn't be so used to it. So, I would print it and put it somewhere on my wall, but I wouldn't stare at it all the time, like I stare at the screen on my phone. So, it's more valuable because I'm not interacting with it every moment of the day." (P4)*

Participants liked the sensation of connecting with a possession, including being able to feel or smell a possession. They liked that these possessions could degrade over the years or through frequent interaction:

> *"I guess it's nice holding something that's physical, and it can degrade and you have to be careful with it rather than the digital stuff that sort of is, well if it's in the cloud, it's going to last for as long as the cloud is going to last…or if you've got it on a hard drive you can always back it up somewhere else, whereas the physical stuff is more precious." (P2)*

4.3.4.2 *Contrasts between possessions related to someone alive and the deceased*

Participants interacted with possessions related to someone alive more frequently than the deceased. They did so to cheer themselves up, or to reminisce. The cues are more frequent, people have montages on walls, scrapbooks, and photographs on their phones. These possessions are more deeply embedded in their daily life. Whereas the possessions related to the deceased subject take on an increased sense of value and sentimentality and as such are stored away safely. This is to protect the possessions themselves as the majority are physical and as such perishable, but also to insulate the

participant from the possession. For interactions with these possessions brings a sense of longing, loss, or finality alongside the happy memories. Participants noted they interacted with possessions related to the deceased with an increased frequency after their passing, which would gradually decline as they came to terms with their loss.

The properties associated with physical possessions that made participants favour them to digital (personalisation, hard work, etc.) in the case of the deceased subject gave interactions with these possessions a feeling of intimacy, and a sense of continued bonds with the person - almost a feeling as if they were still there with them. P8 commented on this continued bond: *"Yeah, I'd say they're both pretty important, but I'd say the cardigan is the most important I'd say because it's kind of like a sense she's with me I know that's weird because it's just an item of clothing."*

This feeling of continued bonds, or the presence of the deceased, was also a property associated with digital possessions. One of two participants (P5) to have chosen a deceased subject who had a large digital presence said the digital possessions were their favourite and made them feel closer to the person they had lost:

> *"I'd probably favour the digital side of it. All you really have is pictures. I don't have that many letters. And I've got things up on the wall, cards up and stuff that she sent but at the same time I think there's a lot more depth to like the music and messages I have online because they're a lot more recent as well..." (P5)*

> *"I think it's just because there's messages on Facebook, there's messages from just a few days before my mum passed and then on my phone I had a picture of the call logs as well which was the day before, and just seems a lot more close to where we left off if you know what I mean." (P5)*

4.3.5 Factors that influence receptiveness towards CC systems

All participants indicated they were open, to varying degrees, to the utilisation of CC - as it was explained to them and as they understood it - to support the bereaved but they had concerns. They all agreed peoples' possessions outliving them was a good thing that could help bereaved people cope with their loss and reminisce. Again, to varying degrees, all the participants were happy with these possessions potentially

being used to generate new possessions related to the deceased, to help memorialise them, or to continue bonds with them.

10 participants spoke positively about employing CC. They liked the idea their possessions, or those of people they had lost could be used as inspiration to create new possessions indicative of how they feel about their loss, the person, or their relationship. P1 spoke positively about the creative element itself of the proposed systems, while P5 and P13 spoke positively about the poetry generation system they had described to them to as part of the study. P5 had experienced trouble selecting a poem for a memorial bench and indicated a system they could use that would create more personal and relatable poems would have been beneficial in those circumstances. P13 saw the poetry system as similar to scrapbooking in that they felt it would help them save *"things for memories sake and reflect on them"* by creating something new - which they liked the idea of. Despite this, there were provisions to the use of CC, and this is where doubt crept in not only for those positive about CC's use but the remaining three people who were unsure or had mixed feelings about it.

Participants did not want systems that altered or destroyed original possessions that had been used as input, that mimicked or imitated the deceased, or transplanted the deceased into new situations (an image created in which the deceased was somewhere they never were). They feared the loss of their possessions, but also feared that their memories or the reputation of the deceased could be tarnished (n=6).

Participants (n=10) liked the idea of systems that supported (through the creation of new possessions) memorialisation, and reflection on existing memories or possessions. P9 commented: *"I think it's nice to use something that a person's left behind to make their, well kind of like a memorial to them."* Participants liked the idea of a poetry system that would either use text from letters or messages they had sent or received, or that they themselves had written in relation to the deceased:

> *"The poem idea I really like. I suppose it reflects the whole scrapbooking, saving things for memories sake, and reflecting on them, and reminiscing that kind of reflects that line of thought. I like being able to collect the possessions in some way. I like that. I like being able to possibly create something new with it." (P13)*

P13 further added: *"I like the idea, especially if it's something about expressing your feelings at the time, and being able to go back and reflect on it and see if you've changed"*

Participants indicated the use of any system or possession would be entirely context-driven and could only be employed how the people close to the deceased would want it. On top of this they felt the privacy of the deceased would need protected. Private possessions shouldn't be available, or usable for everybody, nor should the output they inspire. P13 simplified this: *"if you have access to a private possession there is a reason for this, and you have permission to use it."*

P8 and P13 felt the systems should allow for collaboration and support the sharing of stories between the bereaved. P8 was open to sharing provided they didn't lose the original: *"I guess in a way it would be nice because it means I could share it with other people. But I wouldn't want to lose the original."* and P13 saw a collaborative system as a means of sharing stories:

> *"I think it would be interesting for it to be a collective thing rather than an individual thing. Something that might enable people to find more about their relatives and people who have passed away, a way just to collect it all." (P13)*

P13 had experienced problems already in memorialisation and in continuing bonds with the deceased that could have been solved by such a system. Firstly, in finding something for a memorial toast, and secondly when asked for text for a memorial bench. They felt a CC system would have helped them, and it could have made: *"it a lot more personal…if there was something that could take aspects of* [your feelings/emotions/possessions] *that in mind and find something you find more relatable for it* [than an already existent poem]*."*

Whilst the majority (n=10) of participants spoke positively about these potential systems, two viewed them as clinical - disconnected from the people and relationships - and were worried they would not be able to accurately depict how they felt, or the relationship they had.

4.3.6 Summary of Results

Participants used a variety of physical and digital possessions (when available) to facilitate reminiscence about people who are alive and people who are deceased. Participants, largely, favoured physical possessions as reminiscence aids and attributed more value to them than they did digital possessions. This was often as a result of the history physical possessions accrued as they were created by the person they related to or passed from person to person to eventually come into the participant's possession. This tangible and personalised nature was often remarked as contributing to the value attributed to physical possessions, such as handwritten cards or letters, jumpers the deceased had worn and that smelled of their perfume, and items they had used in their final days such as an oxygen tank or bedding. Despite this, one participant (P5) favoured digital possessions as reminiscence aids. This participant reported that the digital possessions (music, messages, and their call log) were much richer than the physical possessions, and made them feel closer to the deceased as the messages and call logs were created much closer to the deceased's death. Participants, despite favouring physical possessions, indicated that they interacted with digital possessions more frequently. This was because they were easier to access, and because they could be accessed in public with a level of privacy physical possessions could not. Participants also indicated that they found themselves interacting with possessions related to the deceased with an increased frequency directly after the deceased's death and that as they came to terms with their loss the frequency of interactions would lessen until the possessions were put away somewhere safe, and mostly out of sight.

Participants were mostly open to the idea of CC systems being used to support them in their bereavement. Participants liked the idea of systems that could make use of possessions that were once the deceased's to create something new, provided the original possession was not destroyed or altered. Additionally, participants liked the idea of a system into which they could write how they felt and receive a poem or painting that reflected this. Some of the participants felt such a system would be useful in a group setting of people bereaved of the same person. Participants stressed that they would not be open to a system that sought to mimic the deceased or to transpose them into situations in which they do not exist, such as chatbots talking like the deceased or a system photoshopping the deceased into photographs taken after their death.

4.4 Discussion

Our results are in congruence with similar studies carried out by Odom et al [118] which proposed technology for the bereaved should support *"self-determined management of shifting, asymmetric relationships"* (p. 1840) and provide people with ways of dealing with digital possessions *"invoke the intimate bonds of social relationships, and which promote reflection…"* (p. 1840), and Massimi and Baeker [97] argued systems designed to support the bereaved should support storytelling and acknowledge grief is not something to be fixed and that whist life goes on the relationship to the deceased continues. They argue the bereaved should be given control over whether they voice their feelings, who they use the system with, and who they share the output with. Additionally, they argue participation in the creation of new possessions can be beneficial, and that systems to support the bereaved should allow many things to be created. In line with this, work carried out by Kirk and Sellen [80], and Petrelli and Whittaker [136] suggests both physical and digital possessions can become sentimental or meaningful for a variety of reasons including through creation, sharing, and by supporting reminiscence, signifying relationships, and reminding people of important events or periods in time. Kirk and Sellen [80] argue ways of incorporating digital systems into home archiving or the creation of sentimental possessions should be explored further - especially new technologies, and the incorporation of degradation into digital possessions. Petrelli and Whittaker [136], on the other hand, identify problems faced by digital possessions in becoming valued, and posit ways for these to be overcome. They argue digital possessions are often seen as unstable and ephemeral, and too impersonal, to be valued as highly as physical possessions. They likewise suggest new technologies should be investigated, chiefly those that broaden the types of digital possession available and that can potentially make use of digital conversations (e.g. text messages), and that integrate digital possessions into everyday life. We shed additional light on these findings, with an emphasis on how they can be achieved through the implementation of CC into bereavement support, and receptiveness to CC.

In this section we present and discuss 10 design considerations for CC bereavement support tools that arose from the study. We present and discuss each design

opportunity in below, and speculate on potential challenges these considerations may present.

4.4.1 Be available freely online

CC systems designed to support the bereaved should be freely available online. Participants spoke favourably about the accessibility of digital possessions; they liked that digital possessions could be accessed wherever they were provided they had access to a smart device (e.g. smartphone) or computer. Participants also felt that by accessing digital possessions through a device that they are in control of, that interactions with digital possessions could remain private even if it takes place in public. The privacy afforded to interactions with CC systems as a result of accessing them through a smart device could make bereaved people feel more comfortable using the system as and when they need it, be that in public or in private. By making a CC system designed to support bereaved people freely available online pre-existing problems with the availability of support for bereaved people could be tackled [146]. A system freely available online would allow users to interact with the system whenever they want and avoid it whenever they want. This availability would support the oscillation between focusing on bereavement and avoiding it put forth by Stroebe and Schut in their Dual Model process which has been found to be beneficial for the bereaved [152]. It allows users to interact with it from the comfort of their own home, or privately on their phone on the go. Users need not worry about cost, availability, or even what other people may think of what they are feeling as their interactions with the system are private.

4.4.2 Output physical and digital possessions

CC systems designed to support the bereaved should provide users with the option to create physical and digital possessions. Participants valued physical and digital possessions for different reasons and interacted with each differently. Participants indicated that in the immediate aftermath of loss they interacted with possessions related to the deceased more often, and as they came to terms with their loss, they interacted with the possessions less and less. The ability for CC systems to create possessions of whichever materiality the user desires not only supports users create exactly what they want but also possessions they interact with the most (digital) and possessions they value the most (physical). The provision of digital possessions in the

immediate aftermath of loss could support this increased interaction as a result of their easily accessible nature, and the privacy digital possessions offer by requiring access through a device such as a phone. Physical possessions, likewise, could contribute to infrequent interactions with possessions being meaningful by providing tangible possessions that can degrade, and are unique and can be imbued with a sense of history.

Additionally, a system that can output digital and physical possessions would allow users to access the system and digital possessions created on the go or at home, and to interact with physical possessions at home - providing the benefits of physical possessions with the security and accessibility of digital. A system designed to provide possessions matching the user's desire or needs ensures possessions created will be those they value most or are most suitable at that time. This choice provides users with increased control over the systems output and supports users with different requirements. An additional benefit of this choice is that any possession output physically would be accessible even in cases of server, internet, and computer problems. There are many ways this could be implemented ranging from the simple (text document, and printed text document) to the more complex (jpeg, and 3D printed sculpture). The ability to create physical and digital copies of a possession upon creation could also potentially go some way to tackling one of the problems faced by digital possessions identified by Kirk and Sellen [80] - that digital possessions were largely just copies or backups of physical possessions.

4.4.3 Present framing information

CC systems designed to support the bereaved should make use of framing information. Overall, participants felt a lesser sense of ownership over digital possessions than physical possessions. This was in part down to their lack of history, and as a result of the ease in which they can be duplicated, shared, and published online. This potentially lessened sense of ownership could be problematic in the case of digital possessions which have been co-created with a computationally creative system; potentially affecting how meaningful, productive and valuable interactions are with such possessions. Increased levels of psychological ownership have been found to increase user satisfaction, self-esteem, and the quality of their contributions [87], as well as the perceived value of possessions - this is called the Endowment effect [109]. One way

of increasing levels of psychological ownership felt over possessions co-created with a computationally creative system would be to enable the system to produce framing information. Framing information is contextualizing information that explains what the user did, what the system did and how and why, what input it used, why the output is valuable, and so on. This could be produced both during the co-creative process in the form of explanatory text on the input page and loading screens (walking the user through what the system is doing at that time), and at the end, with information such as a title, presentation suggestion, interpretations, and so on. Research in the psychology of art has shown that contextualizing information such as this affects a viewer's understanding, appreciation, meaningfulness and pleasure [86,129]. Increasing the user's feelings of ownership over the possession created in this way could enhance their co-creative experience and ongoing relationship with the possession. Additionally, one of the problems faced by AT was a lack of understanding of what exactly it is, framing information that explains the system, the user's role, and the possession output could help users better understand the system and make them more likely to use it.

4.4.4 Incorporate degradation into digital output

CC systems designed to support the bereaved should incorporate degradation into digital possessions and allow users to choose whether they create digital possessions or degradable digital possessions. Participants frequently cited physical possessions' ability to degrade as something that increased the value attributed to them. The possibility of these possessions degrading or being destroyed influenced how they interacted with the possession and the outcome of their interaction. Participants became guardians of physical possessions and frequently stored them safely out of sight and reach and interacted with them infrequently. The option to create degradable digital possessions provides users with possessions that can degrade over time or through interactions - potentially making interactions more impactful for the person and the possession. Degradable digital possessions could be as simple as a greying, or blurring jpeg. Wallace et al [170] have explored this in greater detail in a study on the design of degradable digital possessions which found degradation can be good, as have Gulotta et al [64] who found the reverse - that digital degradation went against their understandings of digital possessions and in some cases lessened the value attributed to them. Digital degradation in a bereavement context warrants further investigation

due to the sensitive nature of bereavement and because the degradation of the possession could be seen as mimicking the death of the deceased - the effects of which warrant exploration.

4.4.5 Support repeated use

CC systems designed to support bereaved people should be designed in a way that encourages or supports repeated use. Participants liked the idea of a co-creative system with which the bereaved can create new possessions throughout their bereavement experience. They felt this could support the bereaved express their feelings regularly and encourage reflection at a later date. This continued expression of feelings could help the bereaved person come to terms with their loss and provide them with possessions that mark each step forward or backward they make - which can help normalise the bereavement experience and indicate if they should seek additional help. Each possession would be associated with a time and feeling, related to how they felt at that point in their bereavement experience, which could contribute to the possession being imbued with value similar to the physical possessions Kirk and Sellen [80] spoke about reflecting important events or periods in someone's life.

Likewise, the provision of both physical and digital possessions could support repeated interaction with possessions co-created with the system. Participants, despite valuing physical possessions more than digital, largely interacted with digital possessions more than physical possessions, and in general interacted with possessions related to the deceased more in the aftermath of their death with the frequency decreasing as they came to terms with the loss. The provision of both digital and physical possessions from the system would allow the system to provide the bereaved with possessions that support the level of interaction they are likely to require - digital in the immediate aftermath and physical afterwards.

4.4.6 Support varied input

A CC system designed to support the bereaved should support and accept a variety of input (e.g. text messages or transcribed letters) to be used to create possessions. The range of possessions participants selected and spoke about shows there is a rich diversity of possessions, physical and digital, that can be imbued with meaning and reflect a relationship between two people. Participants also indicated they did not interact with all of the possessions regularly or had at times avoided interacting with

the possessions. As such, the system should also allow users to use pre-existing input for the system (e.g. social media posts) or text written for the purpose of creating a new possession which would let users decide whether or not they interact with possessions related to the person they have lost. This would support oscillation between directly dealing with feelings related to bereavement through active participation in the creation process through an activity such as writing input and indirectly dealing with them through having the system retrieve input from elsewhere such as social media. The option to use pre-existing input means users don't have to take time out of their day to write input and means systems could either randomly select input for the user making creation easy, or require the user find and select the input themselves which could contribute to more meaningful possessions being created. The option to write input for creation allows users to avoid having to interact with their possessions related to the person they have lost and contribute to more meaningful possessions being created.

4.4.7 Support private and collaborative use

A CC system designed to support the bereaved should give bereaved users the choice to use the system privately or collaboratively. Some participants indicated they liked the idea of systems that are used privately, whilst others liked the idea of systems that could be used collaboratively, and others liked the idea of a system that supported both private and collaborative use. This would not only allow people to use the system as they wanted, but also support those who prefer to grieve or continue bonds with the deceased alone, and those who prefer to do so collaboratively with others. Even for those comfortable with using the system collaboratively, the ability to also use it privately would allow them to express or use more intimate or private input for the system whilst respecting their own privacy and that of the deceased. As a collaborative process people would be able to share stories or possessions with others and create possessions with richer histories. All of the bereaved, in this instance, could serve as moderators to decide what they feel can be used as input and the desired output. This would also help combat problems faced by users of memorial fora and other online memorial platforms. As these are open (to varying degrees) platforms the bereaved risk encountering trolls or other malicious users. Trolls set out to deliberately aggravate or harass other users which could negatively impact the experience of the bereaved, and how well they are dealing with their loss. The provision of a system that

promotes interaction between one person and the system, or a series of selected people and the system, lessens the potential for the bereaved to be trolled is lessened if not removed. Additionally, the ability to use the system privately supports one of the purported main benefits of writing in AT in that it can be done privately which can normalise bereavement and make it easier to express oneself.

4.4.8 Require user participation

A CC system designed to support bereaved people should encourage user participation in the creation process Participants stipulated that whilst they were open to the use of computationally creative technology to support the bereaved, they did not want anything that attempted to mimic the deceased. Additionally, they liked the idea of possessions created with the system being reflective of how the user was feeling at the time of creation. This would, firstly, ensure that the system does not seek to mimic the deceased but co-create under the influence of the user. Secondly, it could increase feelings of ownership over the possession, and in turn the value attributed to it due to the user playing an active role in its creation [80]. Thirdly, it could provide a platform for users to express themselves, and to accept their loss and process their emotions ala Worden's Four Task Model [177] by writing down their thoughts and feelings.

4.4.9 Employ sentiment analysis

CC systems designed to support the bereaved should employ sentiment analysis to create possessions emotionally reflective of user input. Participants valued possessions that facilitated reminiscence on those they had lost or reflection on how they felt. Additionally, participants liked the idea of a system that could reflect their feelings back to them in the possessions they co-created with the system. A system that employed sentiment analysis on user input to influence the possessions created could help imbue possessions co-created with the system with value and meaning and reflect the user's emotions to be interpreted and processed. This reflective output could also support continued bonds between bereaved and deceased by supporting continued reflection on the relationship and how they feel about the person and their loss. Such output from a system would support the continuation of bonds with the deceased, as is recommended by Worden [177] and Klass et al [82], by creating a series of evolving possessions related to the deceased for the bereaved to interact with. The use of sentiment analysis in the creation process would also help avoid any potential

imitation of the deceased, and possibly contribute to the generation of less clinical, more personal possessions.

4.4.10 Ensure Privacy and Confidentiality

Regardless of whether the bereaved chooses to use the system privately, or collaboratively with people likewise bereaved (e.g. family) it is important that their use of the system remains confidential and that they be granted privacy from those not included in the creation process. Participants spoke about a desire to protect the privacy of the deceased, and their more personal or sensitive memories, stories or possessions related to the deceased. This does not mean that the possession co-created with the system needs to be kept private and confidential, nor the input used to create it but that the system should only give people involved in the creation process access to the possession, and each user access only to their input. Users are free to share their own input with whoever they choose, and likewise the possession they co-create. This emphasis on privacy and confidentiality means people are more likely to use the system and feel at ease doing so. They would not have to worry about betraying the deceased's trust or their own being broken.

4.4.11 Potential Challenges of Identified Design Considerations

We understand the sensitive nature of bereavement, and the need to tread carefully when designing systems that operate within a bereavement context and as such, we acknowledge potential sensitives related to the design considerations we offer.

Repeated use of a bereavement support system could lead to a user developing a dependency on the system which could be detrimental for their mental health, especially if the system were to go offline.

The levels of choice afforded by such a system could lead to users feeling overwhelmed or distressed as bereavement can make decisions onerous. Users may also regret the choices they make and create something they do not want or value.

The process of creating input can be onerous and potentially upsetting. Sharing stories with a system or other people and a system could be emotionally upsetting, and stories shared between humans have the potential to offend and further upset. Additionally,

the emotional labour of writing input for the system may be done without the presence of a trained professional to support the bereaved.

Output not reflective of the user's emotion could upset or distress the user, and additionally create output possessions the user does not feel a connection to. Additionally, output that degrades could evoke fear of loss in the user and emphasise negative feelings associated with bereavement, loss, and the impending loss of a possession.

Information that explains what the system does, how and why, as well as the user's influence and role in the creation process, if not presented in a clear and understandable way, could lead to users becoming confused or disillusioned with the system or output and discourage them from using the system again.

4.5 Conclusion

This chapter provides answers to the first research question: How can CC systems be designed to facilitate current reminiscence practices of the bereaved? By exploring (1) current reminiscence practices related to (i) someone alive and (ii) someone deceased, including the possessions used, the prompts to reminisce, and the outcomes of reminiscence, and (2) receptiveness to CC systems in a bereavement context.

The results of this study suggest that current reminiscence practices can be supported by CC systems, and that people who have experienced bereavement are open to the idea of CC being used to provide bereavement support - provided they do not seek to mimic or transplant the deceased. 10 design considerations for CC systems designed to support the bereaved have been identified and discussed. These considerations chiefly look at supporting self-expression, and the creation of new possessions related to their bereavement experience or the deceased. We believe the design considerations identified and discussed could build on the successes of existing memorialisation and reminiscence technology by tackling the problems identified in the related works section and from the interviews themselves. A CC system available online would increase the availability of help and decrease the cost when using freely available automated software systems. These systems could be used both in informal contexts (e.g. at home), and to complement more formal contexts (e.g. in therapy). Additionally, a well-designed, non-judgmental system can be used to help people get

past creative sticking points. For instance, if someone is having trouble getting started, the system could prompt them, suggest several starting points, or simply make a start and interact with the user later in the process. We envisage such a system will be used by a small number of known people in any one context, so it will not be open to malicious users. By actively creating new artefacts in conjunction with the user, it could help people interact with the resultant feelings of bereavement and support the maintenance of an asymmetric relationship with the deceased. These features would be beneficial in helping the bereaved come to terms with their loss and to overcome their grief.

In the next chapter we report on research that explores how some of the design considerations identified as a result of this research can increase feelings of ownerships over digital possession and contribute to the creation of more meaningful digital possessions.

Chapter 5

5 Study 2: Ownership and Digital Possessions

5.1 Introduction

In the previous chapter a series of design opportunities were identified for CC systems intended to support bereaved people. This chapter documents the findings from the second study of this thesis in which the effects of three of the design opportunities were explored:

1. Encourage users to participate in the creation of new digital possessions
2. Create reflective output
3. Present framing information alongside newly created digital possession

The study sought to determine whether these design opportunities (1) individually, and (2) collectively, can increase feelings of ownership over digitally co-created possessions – in this case poems co-created with a poetry generation system. The study also sought to test the following hypotheses:

1. People feel more ownership over digital possessions they are the sole creator of
2. People feel more ownership over digital possessions they have created more recently
3. Each design opportunity will increase the ownership over digital possessions co-created with the system

The three design opportunities chosen were selected as they were most in line with formal support provided by mental healthcare practitioners to bereaved people – encouraging self-expression, emphatic reflections, and providing contextual

information to increase understanding (see Chapter 2) – and have the potential to facilitate the creation of more meaningful digital possessions (see Chapter 2). To test these three design considerations, we had participants use a co-creative system that was made available to them online, and asked them to create a series of poems with the system and to consider the ownership they felt over each, and why. The aim of the study was to determine whether these three design considerations positively contributed to feelings of ownership over digital possessions, and to elicit greater understanding of what contributes to feelings of psychological ownership, and the creation of a connection between person and possession.

We posit this exploration is important as the results from the first study (Chapter 4) suggest people have more meaningful interactions with possessions they value, and many of the reasons given for possessions being viewed as valued are contributors to psychological ownership (see Chapter 2 and 4). Ownership felt over digital possessions is largely psychological rather than legal – people feel ownership over possessions that they create or that they feel have some personal relation to themselves [40,139]. Previous studies, mainly looking at physical possessions, have found that there are many benefits to ownership including identity creation, and an increased appreciation of the possession [35,48,73,139,142]. As such, investigating ways to increase feelings of ownership over digital possessions could prove beneficial to technologies designed to create digital possessions – especially those designed to support human creativity. The following overarching research question guided the study:

> RQ2: *How can CC systems facilitate the creation of more meaningful digital possessions – digital media such as text files, or music?*

5.2 Study Setup

An online survey was run to explore the impact that the three design considerations (participation, reflective output, and framing information) had over the levels of ownership participants felt over digital possessions.

5.2.1 Procedure

Participants engaged in a series of five tasks relating to digital possessions (see Table 3 and Figure 14). The tasks involved participants selecting previously written digital possessions and writing and creating new digital possessions:

- **Task 1**: participants were asked to select and consider a social media post they had previously written
- **Task 2** participants were asked to write a short piece of text and consider this. In parts 3 – 5 participants were asked to use a CC system made available to them online by the researcher to co-create poems
- **Task 3** asked participants to use the social media post from part 1 as their input for the poem, and asked participants to consider their feelings of ownership of the newly created poem
- **Task 4** asked participants to write a short piece of text about a happy memory they have which was to be used as their input for the poem, and asked participants to consider their feelings of ownership over this poem
- **Task 5** explained that the CC system would use the participant's input as inspiration for a poem, and that the system would seek to create a poem reflective of the participant's emotion. Participants were then asked to write the input and consider their feelings of ownership over the poem

Task	The Possession	Who created it?	What was done?
1	A social media post (post)	The Participant	Ownership ranked and reasoning explained
2	Text written during study (text)	The Participant	
3	A Poem based on the social media post (post poem)	The Participant and System	
4	A Poem based on text written during study (text poem)	The Participant and System	
5	A Poem based on text written during study accompanied by information explaining its creation (framed poem)	The Participant, System, and Researcher	

Table 3: Study 2 Procedure

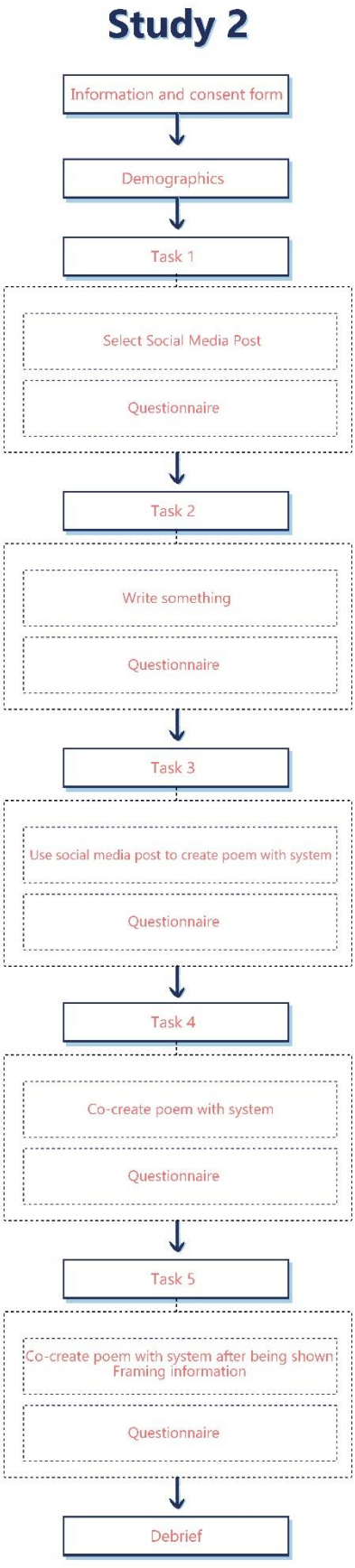


Figure 14: Study 2 Study Flow

Participants were asked to rank their perceived ownership over each digital possession created on a scale of 0 – 4 (no ownership to full ownership), and to provide the reasoning behind each score. The concept of ownership was not explained to participants to avoid potential bias or confusion. Tasks 1 and 2 were used to elicit baseline feelings of ownership over digital possessions solely created by participants, for comparison against digital possession co-created with the system as part of the study.

5.2.2 System

The system used in the study was a Poetry Generation System[14] designed and created by Nikole McCleish [101]. The system produces poems based on user input. It does this by employing sentiment analysis in the form of the Watson Tone Analyser offered by IBM[15]. When a user writes input, the Watson Tone Analyser evaluates the emotional, and langue tone of the input. The emotional tones that are evaluated for are anger, fear, joy and sadness, and the language tones are analytical, confident, and tentative. Each line is analysed and a score of between 0 and 1 is given to each tone, if a tone has a score of 0.5 or less it is omitted, and a score of 0.75 is seen as very likely to be present. For example, if a user were to use the following text as input *"Example text for scoring"* only two tones are detected: (1) joy at a low level of likelihood (0.53) and Analytical at a high level of likelihood (0.98)[16]. The poetry generation system scores each line for the four emotional tones and stores input and emotional score in a database. For example: *"And swear that Beauty lives though lilies die,"* would score false for anger, fear, and joy, and score true for sadness (0.6). This line, and the emotion scores would be stored. Lines that are scored false for every emotion are marked as filler lines for which the output has no distinct emotional content. When a user interacts with the system, they are prompted to enter input. If the input has any emotional content in it the system collects all the lines that score true for any emotion.

[14] The code for the system can be viewed on Github, here: https://github.com/ibm-watson-data-lab/PoemGenerator

[15] A demo of Watson Tone Analyser can be found here: https://tone-analyzer-demo.ng.bluemix.net/

[16] Further documentation on the Tone Analyser can be found here: https://cloud.ibm.com/docs/tone-analyzer?topic=tone-analyzer-utgpe

The system then randomly selects lines to craft a 5-line poem. The system assigns random filler lines for lines 1, 3 and 5.

This system was used due to the ease at which it could be set up and deployed, and because it required very little creative effort on the part of participants. The system as our participants experienced it was a simple website with a text box and a single prompt (see Figure 15).

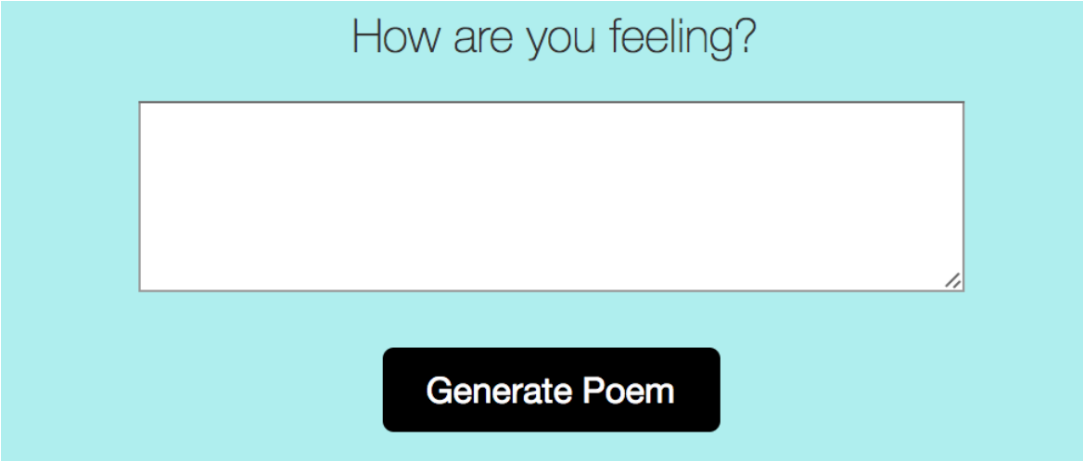


Figure 15: A screenshot of the system

Participants were asked to visit the website and write about how they were feeling or about a happy memory. The system analysed sentiment from user input to calculate its emotion to create a reflective poem. The following framing information was written by the researcher and shown to the user when they were asked to create a framed poem:

> *"The system generated this Poem (Poem 3) based on what you wrote in the 'How are you feeling?' text box. The system looked at your word usage, and calculated the emotion in each of the words you used and tried to create a poem of a similar emotion to the words you used. Your participation in the creation process led to the system generating a poem reflective of the memory you shared, and the words you used."*

5.2.3 Participants

For inclusion participants had to: be between the age of 18 and 34, to increase the likelihood of participants routinely using social media sites; speak English fluently, to ensure participants understood the questionnaire; and have access to and use social

media, to ensure participants had social media posts they could use in the study. There were no exclusion criteria set for gender, country of origin, etc.

We recruited a total of 35 participants (19 female, 16 male) through Prolific [128]. Prolific is an online platform designed to connect researchers with participants (who are rewarded monetarily). It has been successfully used by several universities and researchers [e.g. 2,15,26], and research suggests it provides high quality data and fast access to a diverse participant pool [132]. Participation in the study was rewarded with a payment that generously reflected the time it would likely take participants to complete the study. This meant that no more than 35 participants could be included and was intended to ensure those who did take part felt the researcher valued their time. As a result of using Prolific it is unknown how many people saw the study and opted not to take part, but all 35 participants had completed the study within an hour of recruitment commencing. The use of Prolific for recruitment may have led to the recruitment of participants comfortable using technology.

Participants have been anonymised via the assignment of pseudonyms (P1-P35). Of the 35 participants recruited 16 were male and 19 female. The mean age of participants was 26.82, and both the median and mode were 27. The oldest participant was 34, and the youngest 18. All of the participants at the time of participation lived in the United Kingdom, and all but three were born in the UK. The perspective of the data gathered, and the subsequent findings have been influenced by these demographics.

5.2.4 Analysis

A series of statistical analysis tests were carried out on the quantitative data collected as part of this study, using SPSS – quantitative analysis software (see Chapter 3 for more on quantitative analysis). As the data collected is ordinal data and not normally distributed a series of non-parametric tests were carried out [94,174]. Due to multiple comparisons being made and the sample size , the False Discovery Rate (FDR) was employed to reduce the likelihood of tests making Type 1 errors (false positives) whilst retaining the power to identify significant differences and avoid making type 2 errors (false negatives) [9,112,113]. FDR adjusted p values were calculated by dividing the total number of hypotheses tested by the rank of each p value and by multiplying the original p value by this number. Effect size was calculated using the methods outlined in Olenjnik & Algina [126].

Thematic Analysis [17] was employed to analyse the responses to the open, qualitative, questions: data was grouped into themes (coded) and analysed iteratively to refine these themes across all participants (see Chapter 3 for more information on qualitative analysis). NVivo 12 qualitative analysis software was used.

5.3 Results

5.3.1 Quantitative

A Freidman test was carried out to investigate whether there was a significant difference in ownership felt over the five possessions. The test showed there was a statistically significant difference in ownership levels felt over the possessions, $X^2(2) = 102.695$, $p = <0.001$ (see Table 4: Results of the Freidman Test for mean and standard deviation of ownership felt).

Task	Possession	Mean	Std. Deviation	25th Percentile	Median 50th Percentile	75th Percentile
1	Social Media Post	3.06	1.211	2.00	4.00	4.00
2	Text	3.66	0.873	4.00	4.00	4.00
3	Post Poem	0.54	0.950	0.00	0.00	1.00
4	Text Poem	1.03	1.317	0.00	0.00	2.00
5	Framed Poem	1.11	1.367	0.00	1.00	2.00

Table 4: Results of the Freidman Test

Post hoc analysis with Wilcoxon Signed Rank Tests was carried out to further investigate between which possessions there was a statistically significant difference in the level of ownership felt - these results were used to calculate FDR adjusted p values, and effect size (see Table 5).

Possession	Comparison with	Z	p value	FDR adjusted p value	Effect size r
Social Media Post	Text	-2.596	0.009	0.01	0.310
	Post Poem	-5.055	<0.001	<0.001	0.604
	Text Poem	-4.602	<0.001	<0.001	0.550
	Framed Poem	-4.412	<0.001	<0.001	0.527
Text	Post Poem	-5.127	<0.001	<0.001	0.613
	Text Poem	-5.007	<0.001	<0.001	0.598

	Framed Poem	-4.916	<0.001	<0.001	0.588
Post Poem	Text Poem	--3.169	0.002	0.0028571	0.379
	Framed Poem	-2.745	0.006	0.0075	0.328
Text Poem	Framed Poem	-0.291	0.771	0.771	0.035

Table 5: Results of the Wilcoxon Signed Rank Tests

The results of the Wilcoxon Signed Ranks Tests indicate:

- The level of ownership felt over the social media post is significantly lower than the ownership felt over the text, and significantly higher than the ownership felt over the three poems
- The level of ownership felt over the text is significantly higher than the ownership felt over the three poems
- The level of ownership felt over the post poem is significantly lower than the ownership felt over the text and framed poems
- The level of ownership felt over the text poem is not significantly lower than the ownership felt over the framed poem

Kruskal-Wallis Tests were conducted to investigate whether age or gender influenced the levels of ownership felt over the possessions in a statistically significant manner. Descriptive statistics showed that those aged 18 – 24 felt higher levels of ownership than those 25 and over, but the results of the Kruskal-Wallis Test were not significant. Likewise, descriptive statistics showed that females felt more ownership than males over the digital possessions except for the social media post, but the results of the Kruskal-Wallis test were not significant.

5.3.2 Qualitative

We focussed on two key aspects of the results – (1) Ownership, and (2) Factors that influence ownership – from which surfaced several themes. Each of which will be discussed in turn.

5.3.2.1 *Ownership*

Participants mainly spoke about ownership in terms of psychological ownership, rather than legal ownership. P16 summarised this in the following comment: *"I don't feel ownership in the sense of property, more emotional ownership in the sense of 'these are my words.'"* Only 12 participants even indirectly mentioned legal

ownership, and those that did mention legal ownership did so negatively in relation to digital content. For some, this was because they simply reposted pre-existing material or used repurposed pre-existing material for their own ends, such as P13 who remarked: "*Most of me feels ownership over the post because the edited pictures are all mine as well as the text and hashtags. However, the actual pictures of the person used in the edited images were taken from Google."* P13 also reposted something they found on another page, and so felt *"…it is not mine."* Others felt they lost ownership by posting it to social media with P19, and P2 respectively stating: *"I know that anything posted on social media no longer belongs to you"* and *"I wrote* [the] *post but on Facebook so technically they own it."* Only one participant spoke positively in regard to legal ownership over a digital possession: *"I wrote the tweet and therefore I technically do have ownership over my words…"* (P22). In regards to the poems co-created with the system, participants felt little legal ownership over the possession, with P22 stating: *"…the poem itself isn't written by me and I therefore have no technical ownership of it…"* and P1 remarking: *"I don't feel any ownership over it. I feel it would be plagiarism if I did feel any ownership."*

In contrast to this, all 35 participants spoke of ownership in psychological terms with 218 instances coded to legal ownership's 16 mentions. This suggests our focus on increasing psychological ownership is valid and could prove useful. Psychological ownership was felt for many reasons, ranging from a possession having personal meaning, the participant having actively created it, and the user having control over it. All of which will be detailed more in the following section in which we discuss factors that influence psychological ownership.

5.3.2.2 *Factors that influence perceived ownership*

We identified a series of 6 themes that influenced participants' perceived ownership level over digital possessions positively and negatively: (1) Participation; (2); Personal Touch; (3) Reflective Output; (4) Control; (5) Meaning, and; (6) Framing information. Each of which will be discussed in turn below.

5.3.2.2.1 Participation

Participation – being actively involved in the creation of a possession - contributes to a person's perceived ownership over it. A lack of participation contributes to lesser feelings (if any) of ownership over the possession. These effects of participation were,

for our participants, universally felt for possessions which participants created themselves, and for the poems they co-created with the system.

Feelings of ownership over the post (task 1) and text (task 2) were significantly higher than over the co-created poems (task 3 – 5's post, text, and framed poems). P11 attributed this increased level of ownership in part due to the active role they played in the possession's creation: *"The items that I personally wrote I feel more ownership over",* as did P15: *"The stuff I wrote is mine, the others are not."* The lack of ownership participants felt over the co-created poems was, in part, due to a lack of participation in the creation process. P10 put it simply when discussing the post poem (task 3): *"I don't feel any sort of ownership as I did not create this poem"* as did P2 when discussing all three poems: *"I don't feel any ownership as* [I] *did not write the poem"*. However, as participation in the creation process with the system increased (writing input about a happy memory or how the participant was feeling) participants began to feel an increased sense of ownership. P10 went on to state that they felt no ownership over the post poem (task 3), an increased sense of ownership over the text poem (task 4) *"as it was generated from my memory"* and an increased again sense of ownership over the framed poem *"…as it was created by using emotion from word I had used to write about how I felt.* P13 went almost as far as sharing ownership over the created poems with the system, in relation to the post and text poems (tasks 3 and 4):

> *"I feel half ownership over* [the post and text poems] *because the text used to generate the poem was my words which I had written. However, I also half don't feel ownership because the generated poem came from a generator and doesn't include my words."*

Some participants spoke about social media posts that included content created by others, which lessened their feelings of ownership over the possession but not significantly so due to other factors: *"I didn't create the content (the video and the dubbed music over the top) however, the text was mine and the emotions I felt belonged to me"* (P17). In contrast, P22 commented: *"The text I wrote is ranked highest ownership because it is written by me using my own words, thoughts, memories and emotions"*.

5.3.2.2.2 Personal Touch

Possessions that feel personal or relate to personal issues or information are attributed higher levels of perceived ownership. The possessions created solely by participants tended to be viewed as the most personal. Writing about personal memories or family members contributed to the level of ownership that participants felt over the possessions: "*I feel ownership as* [it is] *a personal memory*" (P2) Possessions that were not only based on a personal memory, but also one involving or related to family or friends were likewise treated as personal. P1, and P10 (respectively) illustrate this in the following quotes: *"It is a sentence which has personal meaning to me as it relates to a family member whereas it won't to anyone else so I feel more ownership over it than anyone else"* and *"I have ownership over it because it is my memory that involved only my family".* Not only does the presence of something personal in a possession contribute to perceived levels of ownership, it can also help combat factors that negatively influence ownership such as a lack of participation in the creation process. P20, when speaking about a possession they hadn't created but felt ownership over, stated they felt ownership over it as *"It was read at our wedding, so I feel I have a personal connection to it."*

The possessions that participants co-created with the system further verify the importance of a personal connection to a possession. When participants used personal information such as memories or feelings as input for the system to create poems, feelings of ownership were higher:

> *"…I feel great amounts of ownership over this poem as the original memory that I personally wrote into the poem generator was purely written by me and then I automatically generated the memory into a poem which is good." (P24)*

Likewise, when participants felt the poems output by the system contained information that was personal or related to their personal information, they felt an increased sense of ownership over the possession and attributed it more value than those that did not feel poems were personal:

> *"I don't value any of the poems at all as 'mine', but if I had to rank them, I would consider the one about the text as more valuable as it relates to a more personal memory." (P30)*

All of the possessions from each task were attributed lesser ownership when the aforementioned feelings of personal relation were missing or lesser. P22's sense of ownership over a social media post they had written was lessened due its content reflecting widely held opinions: *"I wrote the tweet and therefore I technically do have ownership over my words, however I am aware that the tweet highlights something that a lot of people feel strongly about so I do not feel much ownership over the opinion or the tweet because of this",* as was their sense of ownership over the first poem generated using this social media post as the input: *"My ownership over the social media post and the first poem using the social media post are ranked lowest because they are based on widely used opinions."* This lack of a personal connection or a *"personal touch"* in the co-created poems contributed to lower ownership being felt over them. P12 felt one of the poems had *"very little to do with me"* and P20 went a step further in saying *"Some parts feel relevant but on the whole it is more related to a stranger".*

From this it would seem personal touch is not enough by itself, to significantly increase ownership. Another contributing factor, reflective output, is identified by P26 as something that lessened their feelings of ownership despite personal input being used to generate poems: *"I feel a lower level of ownership as it is not my own words. They are based on my personal story but the emotions described are not matching what I truly felt. There is a lack of accuracy and feels less relevant."* We will go on to discuss reflective output next.

5.3.2.2.3 Reflective Output

Possessions that reflected how the participant felt at a given moment in time were attributed higher levels of ownership. P10 touched upon this when discussing ownership felt over the three co-created poems: *"Poem 1 I feel no ownership over as it was just generated from my social media post. Poem 2 I rated* [higher]*...as it was generated from my memory. I rated Poem 3* [higher again] *...on the ownership scale as it was created by using the emotion from words, I had used to write about how I felt."* In general, this proved to be the case, if the system calculated the correct emotions, and generated a poem participants felt reflected their input ownership increased. P34 upon generating a poem they felt reflected their emotion stated they were *"Feeling nearly full ownership as my words and feelings generated this poem based on those words"*, while P34 went a step further in stating: *"Since the generator*

is using the emotions in my words to generate the poem I feel like I have full ownership over it now." The increase in ownership was not as drastic as this in all cases, but it did contribute to many participants feeling an increased sense of ownership. P9 put it simply: *"It is quite a sad poem and it does compute with my emotions today"*, whilst P17 provided increased detail for their increased sense of ownership over one of the poems using freshly written input: *"The poem is much more relatable to my feelings. It has the same presence of relaxation and pensive reflection. As it is based solely on my emotions and memories I have a greater sense of ownership"* but stipulated: *"It depends on how involved I was with the content and where the text came from. The social media post was my thoughts but not my content, instead it was shared. The memories were my own but the computer generation took away some of the humanity. Yet the final poem, as it was solely my own current thoughts and feelings resonated greater with me".* P26 also felt an increase in ownership upon co-creating a poem with the system using fresh input, stating: *"I feel a quite strong sense of ownership. The adjectives used to describe my feelings and emotions are quite accurate. I like the use of metaphors as I could use them myself. It's somewhere between love and nostalgia, things fading away."* Despite this noted increase in feelings of ownership, P26 went on to say: *"The poem 3 was the most accurate to me because of the metaphors used; but overall I do not feel any ownership over these poems."*

Not everyone was presented with a poem they felt accurately reflected their feelings. For some, like P33, this was not enough to stop them from feeling a small increase in ownership: *"Although I still feel like this poem missed the point, I feel a little resonance with some of the lines."* For others, the system creating poems participants felt did not reflect their emotions negatively impacted the level of ownership they felt over the co-created output. P1 summarised this best in the following comment: *"I don't feel any ownership of the poem as I don't feel it reflected what I had said at all (maybe even the opposite). They are not my words and don't reflect my feelings so I don't have any connection with it."* In fact, one participant, P26, highlighted the lack of accuracy as a reason behind the lack of ownership felt over the system's output: *"I feel a lower level of ownership as it is not my own words. They are based on my personal story but the emotions described are not matching what I truly felt. There is a lack of accuracy and feels less relevant."* Whilst others commented on the system's failure to accurately create output reflective of their actual mood, with P16 and P25 respectively stating:

"This poem does not seem to have the same outlook as the memory I shared, and indeed seems to be pessimistic, conversely to my optimistic memory. Analysis of the words used to generate the poem seems naive, perhaps the context must be considered as a whole." "I feel it does not represent my feelings of mood from the post and I did not write it so I have no connection at all."

5.3.2.2.4 Control

A sense of control over the possession contributed to participant's feelings of ownership over possessions. Participants who felt they were in control when creating the possession, and remained in control of the possession once it was created felt higher levels of ownership over possessions than if they felt a lack of control in either of these two scenarios. P3 spoke about this feeling of control throughout the creation process and after: *"I wrote it and I feel my words have meaning and I have a right to say them and control how they are viewed"*. P3 was not the only participant to speak about this, P12 commented: *"I was in complete control of the ones ranked highest hence I feel more ownership, the others aren't personal to me"* and P32 went on to say *"I created the post and can edit or delete it if I want".* Other participants felt a sense of control through their decision to share their possessions, P26 remarked: "*I have not told the world about it and put it into a public domain I have chosen to share it under my conditions"* and went on to further comment: *"I own this social media account* [that the possession was posted on] *and feel in control of what I share and feel proud of showing that I'm in control of my own living condition."*

However, not everybody felt the same level of control as the above participants did once possessions were shared online. Some felt they lost legal ownership upon sharing them on social media such as P2 who commented: *"I wrote post but on Facebook so technically they own it."* Other participants felt they lost control of their possession once it was made public, such as P19 who said: *"Again, it is about my life and my family however it is written publicly so I have no control over what is done with it."* Participants commented on this lack of control as one of the reasons they felt lesser ownership over the poems co-created with the system. P12 and P19 both felt they lost control during the creation process, and this lack of control was felt upon the system outputting a poem. P12 commented: *"I'm involved in it but I didn't post it"*, whilst P19 stated: *"I didn't write it, it's not personal and I have no control over it."*

5.3.2.2.5 Meaning

Possessions being attributed a sense of meaning, or being received as meaningful, contributed to participants' feelings of ownership over possessions. For some participants meaning came from a personal connection to a possession, such as P20 who felt ownership over a possession that was not theirs as: *"It was read at our wedding so I feel like I have a personal connection to it"* and P12 who felt an increased sense of ownership over a possession as: *"it's something I was proud of and wanted to post"*. Others felt their possessions could be meaningful to others, either as useful information such as P24 who stated: "*I feel that I have great amounts of ownership over the social media post that I wrote as I personally wrote this quote and I think it can be very interesting to other people who may be considering changing their sleeping patterns so that they can regularly go to sleep early at night, along with getting a good amount of hours sleep, and then waking up nice and early, first thing in the morning, which can be both healthy and important for people"* and P25 who felt: *"…it was important for me to say how I felt from a certain point of view and show people what I do."*

One participant, P18, felt all of their possessions lacked meaning and as such would have liked to have scored them all "I don't feel any ownership". P18 commented that the social media post was *"…just a post- I'm not bothered about it that much. It was just about a day"* and went on to say about the text they were asked to write: *"It is just writing about an experience – I have no intention of doing anything with it. I feel neutral towards it."* Indicating that the lack of meaning they attributed these possessions severely lessened the ownership felt over the possessions. Some participants identified a lack of meaning in the co-created poems. P9 remarked: *"The poem…gives no proper meaning"*, and P32 agreed saying: *"I feel some ownership because* [the poem] *it is somewhat relevant to what I wrote. However it is very generic and the poem does not have much meaning."* Whilst other participants felt the system produced poems that were not reflective of the participant's input and as such made no sense. P23 stated: *"I do not feel a sense of ownership over this post. I wrote the post myself about a true experience that happened recently at work but the poem doesn't make much sense to me."* While P34 said much the same thing in a simplified manner: *"It doesn't make sense and isn't made by me so therefore I don't own it."*

5.3.2.2.6 Framing Information

When participants were presented with Framing Information which made them aware of the influence they had over the system and its output, feelings of ownership increased for many participants. This framing information helped participants see the uniqueness of each generated poem. P10 when presented with a poem and associated framing information provided the following rationale for their increased feelings of ownership: *"The poem was generated due to what I felt so if I had felt differently the outcome wouldn't be the same."* Other participants felt increased feelings of ownership over the possessions simply due to their increased understanding of how it was made and their influence over it. P34 commented on how they felt an increased sense of ownership over each poem as each poem was created due to their increasing understanding of how they were made: *"I felt more ownership as time went on due to the explanation of how the generator worked"*. Upon co-creating the poem which was accompanied by framing information P34 went on to add they were *"Feeling nearly full ownership* [over the poem] *as my words and feelings generated this poem based on those words"*. P13 made similar comments: *"Since the generator is using the emotions in my words to generate the poem I feel like I have full ownership over it now"*, and spoke about this in more depth in relation to the poem accompanied by framing information: *"Poem 3 - After finding out the explanation of what was happening with the generator and how the poem was generated, I felt full ownership over it."* Likewise, P17 felt an increased sense of ownership over the co-created poem (just not to the same extent) due to this increase in knowledge: *"The poem is much more relatable to my feelings. It has the same presence of relaxation and pensive reflection. As it is based solely on my emotions and memories I have a greater sense of ownership"*. Whereas one participant, P34, worried that the system interpreting their input could change its meaning and lead to the creation of less meaningful possessions. P34 said:

> *"That is the interesting thing about reading someone else's writing and interpreting it, as everyone does this differently, two people can take different meanings from one bit of text, and when a system takes that process out of the equation (and just shows the poem based on the emotion it feels was in the writing) it may change the interpretation for some people, and I think it's this*

aspect (the system doing the interpretation of emotion) that is changing the overall feeling of ownership for me. As some of the words I had written lose their power, if people are only shown the poem they may get the wrong idea."

5.3.3 Summary of Results

Participants mostly spoke of psychological ownership, rather than legal ownership, especially in relation to digital possessions. Those who spoke of legal ownership in relation to digital possessions did so when discussing social media posts they had made that contained content that belonged to other people such as music, pictures, or quotations. Two participants raised concerns with the legal ownership of possessions co-created with CC systems noting that the words were not written by them and as such they felt they had no *"technical ownership of it"*, and the other participant felt it would be plagiarism to claim the poem as their own.

Participants, largely, reported they attributed more ownership to the possessions they had created by themselves – post (task 1) and text (task 2) than the co-created poems (task 3 -5). In terms of what contributed to these feelings of psychological (or perceived) ownership we identified 6 factors that contribute to feelings of ownership over digital possessions. Participants felt increased ownership over possessions they actively, and recently participated in the creation of. These feelings of ownership were more powerful when participants felt they had played a larger, or sole role in the creation of the possession. Participants felt increased ownership over possessions that felt personal, and that reflected memories or emotions important to the participant. Participants felt increased ownership over possessions that were reflective of how the participant felt at the time of the possession's creation. Participants felt increased ownership over possessions they felt they were in control of. Participants also felt increased ownership over possessions that had meaning to them. The 3 design considerations tested in this study were found to influence the level of ownership felt over the digital possessions participants co-created with the system. When participants actively participated in the co-creation of the poems, feelings of ownership were increased, as they were when the system accurately reflected user emotion, and explained the user's influence on what is created. However, when the user felt like control or influence over the poem created, the system reflected in inaccurate emotion, or did not suitably explain the user's impact, feelings of ownership remained lesser.

5.4 Discussion

The results of the statistical analysis show that the 3 design considerations (participation, reflective output, and framing information) tested as part of the study positively contributed to the levels of ownership felt over digital possessions. A digital possession created by the participants during the study (text) was attributed higher levels of ownership than a possession created in the past (task 1's social media post). This suggests recent participation in the creation process can increase ownership felt. Additionally, it may suggest the purpose of creation can likewise influence the levels of ownership attributed to digital possessions (for example, something created for an academic study as opposed to a social media post). Digital possessions created solely by the participant were attributed higher levels of ownership than those participants co-created with the system. This suggests a perceived lack of participation in, control over, and understanding of the digital possession co-created with the system decreases ownership felt. The reverse of this is evidenced in the ownership levels attributed to the text poem (task 4) and framed poem (task 5) compared to the post poem (task 3). The poems with increased participation in the creation process (text poem and framed poem) are attributed a higher level of ownership, as is the poem which provides information to help understand the participant's influence over what has been created, why it was created, and how the system created it (framed poem).

Likewise, the thematic analysis results show the positive impact of the three recommendations and shed additional light on them and additional factors. Of the 6 subthemes that influence ownership the following 4 were the most prominent: Control (18/35), Participation (32/35), Personal (32/35), and Reflective Output (30/35). The prevalence of these themes is promising as they are in congruence with the design considerations identified in Study 1 (Chapter 4) for CC systems intended to support the bereaved and suggests their appropriateness. We have grouped each of the 6 subthemes below by the contributions they make and will discuss each of these contributions in turn. The contributions and subtheme groupings are:

- **Stress User Interaction**, in which Participation and Control are discussed
- **Form a Connection between Owner and Possession**, in which personal touch, reflective output, and meaning are discussed

- **Increase Understanding**, in which framing information is discussed

The results resonate with previous work on the characteristics of digital possessions, and psychological ownership. We found by creating a reflective digital possession participants feel a connection to it and oft times imbue it with personal meaning, and that framing information increased participants understanding and contributed to feelings of control and a personal connection towards the new possession [35,139]. The presence and representation of self-achieved by requiring users participate in the creation process, and implementing sentiment analysis to create reflective output, and perceived control over the creation of the possession achieved by requiring the user participate in the creation process and the provision of framing information helped increase psychological ownership over the possession. The system used in our study successfully tackled many of the identified elements that contribute to ownership (these will be discussed next), and shed further light on related findings by researchers exploring characteristics of digital possessions, and technology for the bereaved [35,97,107,119].

5.4.1 Stress User Interaction

The results of our statistical analysis and thematic analysis showed recent participation in the creation of new possessions significantly increased the levels of ownership participants felt over the resultant possession. This was the case for possessions solely created by the participant, and to a lesser degree to the possessions co-created with the system. The lessened effect of participation for the co-created possessions was a result of the introduction of a computational collaborator. Participants did not feel they had written the poem output by the system as they had their social media post (task 1) or text wrote during the study (task 2). Additionally, participants felt they contributed little to the system's output – they participated however briefly at the start and the system did everything else. This participation was found to be closely linked to control. Participants felt they had little control over what the system did with their input and the output it created. One participant went as far as feeling less ownership over text they wrote during the study due to being asked to do so for the purposes of the study.

This suggests the system should be more interactive and require user participation throughout the creation process. This could be achieved by the system presenting the

user with options related to how the system will use their input, and what the output will be. The implementation of this could be as simple as the system asking, after the user submits their input, a series of questions related to its creative processes, for example: how reflective does the user want the output, how much creative leeway does the system get, does the user want a ballad, free verse, or haiku? The provision of these additional interactions also increases the influence users have over what is created and as such could increase user control. As could the inclusion of additional options at the end once the possession has been created, related to in which form they want the newly created possession – physical, digital, or both. All of which could contribute to heightened feelings of ownership over co-created digital possessions.

5.4.2 Form a Connection between Owner and Possession

The results, in line with work on psychological ownership (see related works), suggest ownership can be increased by increasing the personal stake users have in the possession. In our case we sought to do this by 1) imbuing the system's output with a personal (to the user) touch, 2) creating output that is reflective of the user's input, and 3) creating output with meaning. Participants who wrote input for the system that was personal to them and had meaning felt a closer connection to the co-created possession and reported higher levels of ownership over it than those that simply wrote *"I am bored".* Despite this, the output did not always feel personal. It may have seemed random or disconnected to the participant or contained words they would not have used. Systems with few constraints produce output users have varying degrees of ownership over. Mainly due to a feeling the poem is not reflective of what they have written (they can't see their own words in it), or feel the poem misses its mark (re: emotion). Suggesting a more constraint based, almost template like system may produce output users feel more ownership over. Like this, the emotional sentiment of the poems when participants felt it was accurate contributed to a connection with the possession and feelings of ownership, but this was not always the case. Due to the system not always being able to achieve a personal touch and produce reflective output it was likewise harder to create meaningful possessions. Possessions that are reflective of a person's feelings are attributed higher levels of perceived ownership. The prototype system we employed used sentiment analysis on user generated input in attempt to create output of a similar emotion. This process was found to be effective in increasing perceived levels of ownership over possessions but not in a significant

way. The system often created output participants couldn't see their influence over or disagreed with the resultant emotion. The main reasons co-created possessions tended not to be viewed as having meaning were due to the lack of personal touch, non-reflective output, but also because participants were (largely) not writing about meaningful aspects of their lives. They wrote about everyday life in very little detail. They wrote in generalities and as such didn't receive nuanced poems in which they sought meaning. This could be different in an emotional context – such as bereavement.

This suggests that, on top of the improvements suggested in the previous section that could also help here, the system should be more constrained. The system should utilise user input more and be granted less creative leeway as a default. If the system were to use words, phrases, or even names given by the user in the output a personal touch would be much more visible. Additionally, this would contribute to a greater meaning being attributed to these possessions. The problems associated with reflective output suggest further work needs to be done on sentiment analysis and how it is employed within these systems. Sentiment Analysis methods themselves will only improve over the coming years to become more accurate, but the ways it is employed should also be considered. The system as it was used in this study used lines created using sentiment analysis for half of the poem and utilised filler lines for the rest. These systems could look at using sentiment analysis informed lines for each line, or they could calculate an overall emotion for the poem rather than line by line. Finally, if unlike in this study, users were bereaved and writing about bereavement the possessions may take on more meaning. These co-created possessions would change from poems about how the participant is *"bored"* to being about loss, love, and intimate relationships.

5.4.3 Increase Understanding

The results of our statistical analysis and thematic analysis showed framing information (information explaining what the system is doing, why, how, and the participant's influence over it) significantly increased levels of ownership participants felt over co-created possessions. When participants were presented with Framing Information that explained their influence over the system and its output and felt (as not all of them did) that their input was used as inspiration for the poem generated participants tended to view the possession created as more personal and attributed it with a higher level of ownership.

This suggests that whilst Framing Information can increase feelings of ownership, simply accompanying the output does not seem enough. It should be embedded within the system, and at the very least explain in simple terms exactly what the system is doing and the user's influence. A potential area to research further would be what framing information users find useful in the hope of increasing its effectiveness. In line with our thematic analysis findings it may be beneficial for the Framing Information to cover each of the six key subthemes we found related to factors that influence ownership.

5.5 Conclusion

This chapter provides answers to the second research question: "*How can CC systems facilitate the creation of more meaningful digital possessions – digital media such as text files, or music?"* By exploring the impact 3 of the design considerations have on the ownership felt over co-created digital possessions.

The findings presented resonate with work on psychological ownership carried out by Pierce et al [139] and Dawkins et al [40], that found three major routes towards psychological ownership over objects. Those being (1) control of the object, (2) coming to know or understand the object intimately, and (3) investing the self in the object. The results of our study show recent, and active participation in the creation process increased feelings of ownership and control felt over digital possessions, and asking participants to write about something personal to them increased the likelihood of the possessions co-created being attributed a personal (to the participant) touch and contributed to the creation of meaningful possessions both of which can increase levels of ownership over digital possessions. The creation of reflective output (based on user input) was also shown to increase feelings of ownership over co-created digital possessions, but only if the participant felt the system had analysed and reflected the correct emotions. Reflective output based on personal input was also shown to positively influence the connection between user and output and as such increase the ownership felt over co-created digital possessions. Framing information also contributed to increased feelings of ownership over digital possessions by increasing user understanding of their influence over the system and its output which helped them better understand the output and how it related to them and their input – but only if participants felt the system had calculated their emotion correctly.

In the next chapter we report on research that explores the support provided to bereaved individuals by mental healthcare practitioners, and their evaluations and opinions of and about the design considerations identified in Study 1, including those tested and reported on in this chapter.

Chapter 6

6 Study 3: Expert Interviews and Design Opportunity Evaluation

6.1 Introduction

In Chapter 3 a series of design opportunities were identified for CC systems intended to support bereaved people, and in the previous chapter (Chapter 5) three of these were user tested. This chapter documents the findings from the third study of this thesis in which the support provided to bereaved people by mental healthcare practitioners was explored, and Chapter 4's design opportunities were evaluated by mental healthcare practitioners. The study sought to determine how helpful mental healthcare practitioners felt the design opportunities identified are, and how they align with the support provided by the mental healthcare practitioners to bereaved clients. To do this we had participants relay their experiences of providing support to the bereaved, reflecting on what they felt was most beneficial to the bereaved and what challenges they faced in providing support. After which, participants were given a brief presentation in which CC was explained, an example system described, and the ten design opportunities (Chapter 4) presented - which participants were subsequently asked to evaluate in terms of perceived helpfulness to the bereaved on a series of Likert scales.

We posit this exploration is important as those who provide support to the bereaved can (in)validate the design opportunities identified and contribute to their development. UCD principles encourage designers and developers to consider not only potential end users but also experts in the field in which systems are intended to operate. Consulting with those who provide mental healthcare support to the bereaved

ensures the opportunities identified are likely to inform the design of CC systems that help the bereaved. The following overarching research question guided the study:

> RQ3: How can CC systems be designed to reflect the approach taken in formal interventions to support the bereaved?

6.2 Study Setup

6.2.1 Procedure

Participants took part in a single semi-structured interview with the researcher each of which was audio-recorded for transcription. The interviews conducted were divided into two sections (see Figure 16) intended to: (1) explore how mental health care practitioners support the bereaved; (2) have experts evaluate previously identified design opportunities for CC Bereavement Support Tools; (3) to elicit any further suggestions mental health care practitioners may have; and, (4) to explore the receptiveness of mental health care practitioners to the implementation of CC Bereavement Support Tools.

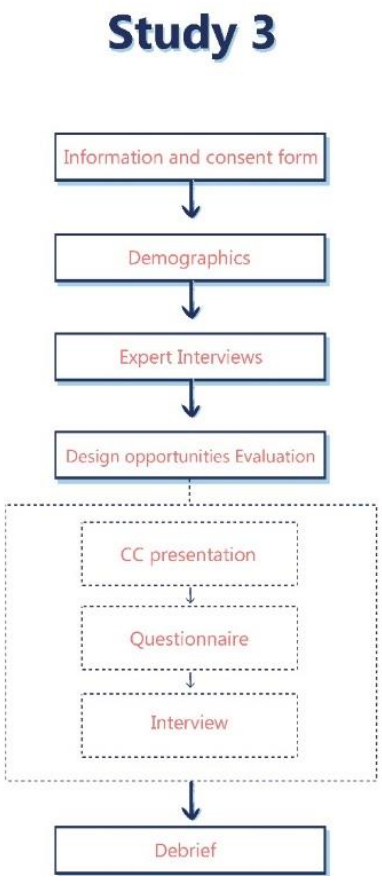


Figure 16: Study 3 Study Flow

6.2.1.1 *Expert Interviews*

In **Section I** participants were asked questions about their professional and educational background and history, their current role in the field, and their approach to the support they provide. This line of questioning helped put participants at ease and helped the researcher identify bereavement theories or models considered by participants. Afterwards, participants were asked questions about what, in their experience, contributes to or detracts from a session in which they successfully support the bereaved. Additionally, participants were asked to walk the researcher through an example session the participant might run, and to discuss sessions they have had with patients in the past that went well and that went badly. These lines of questioning allowed the researcher to identify elements of support that should be considered in the design of bereavement technology.

6.2.1.2 *Design Opportunities Evaluation*

In **Section II**, participants were given an introductory PowerPoint presentation that: (1) explained what CC means in simple terms; (2) described an example system; and, (3) introduced them to the design opportunities to be evaluated. After the presentation participants were free to ask any questions they had and were asked to evaluate a series of design opportunities previously identified for CC Bereavement Support Tools (Chapter 4): (R1) Be available freely online; (R2) Output physical and digital possessions; (R3) Present Framing Information, this is information that explains what the system does and why, and the influence the user has over it; (R4) Incorporate Degradation into digital output; (R5) Support repeated use; (R6) Support varied input; (R7) Support private and collaborative use; (R8) Encourage user participation; (R9) Employ Sentiment Analysis; and, (R10) Ensure privacy and confidentiality. They were asked to rank each opportunity on a 5 point Likert scale of how useful or helpful they felt each opportunity could be in a system designed to support the bereaved (from not at all, to very) and were then asked to explain the reasoning behind their answer. Once participants had completed this task they were asked if they had any recommendations for a CC system intended to support bereaved people, whether the opportunities evaluated could be improved, and to explore their receptiveness to the use of CC Bereavement Support Tools.

6.2.1.3 *Study Setting*

Semi-structured interviews were conducted in private, on a one to one basis. Interviews took place in a private meeting room at the participant's place of work when possible, and when not possible in a private meeting room at the university.

6.2.2 Participants

For inclusion participants had to be: over the age of 18; speak English fluently; and be working, either professionally or as a volunteer, providing mental health support to the bereaved. There were no exclusion criteria set for gender, country of origin, etc. We recruited a total of 7 participants by contacting local and national charities that provide bereavement support, and in some cases using snowball sampling (some participants recommended people to contact). Potentially as a result of bereavement charities throughout Scotland making use of similar techniques and training there was significant overlap in the techniques, they employed to support bereaved people. All participants were female, and between the age of 37 and 72 - due to a technical difficulty the exact age of one participant was lost. Participants had spent between 9 and 26 years working with the bereaved. Participants worked with the bereaved in various roles: one as a psychotherapist; two as Cruse volunteers; one as a Cancer Support Specialist; one as a counselling psychologist; one as a therapeutic writing facilitator; one as a counsellor; and one as a hospice chaplain. Despite the various roles, the majority of participants had undergone the same initial training and were obligated to undertake continued professional development to ensure the support they provide is appropriate and effective. All participants at the time of participation lived and worked in the United Kingdom. The perspective of the data gathered, and subsequent findings have been influenced by these demographics. Participants have been anonymised via the assignment of pseudonyms (P1 – P7).

6.2.3 Analysis

Thematic Analysis [17] was used to analyse the interview transcripts. This consisted of data being grouped into themes (coded) and analysed iteratively to refine themes across all participants. NVivo, qualitative analysis software, was used to conduct the Thematic Analysis.

6.3 Results

Two main themes were identified in the interview data as to how participants supported their bereaved clients and the ways they felt the design opportunities evaluated could lead to the creation of a CC system that similarly supports the bereaved. These are: (1) Promote Participation; and, (2) Promote Wellbeing. These themes, and their respective subthemes, will be discussed in turn (and can be seen in Table 6).

Theme	**Subtheme**
Promote Participation	Access
	Client driven
	Express in many ways
	Informed by bereavement theories
	Provide a safe space
	Contextualise
	Build a relationship or familiarity
	Treat the client with unconditional positive regard
Promote Wellbeing	Normalise
	Hear them out and help understand
	Create a connection
	Assess wellbeing
	Signpost additional help

Table 6: Design Opportunities Organised by Theme

6.3.1 Expert Interviews

6.3.1.1 *Promote Participation*

Participants noted the readiness of clients to participate in treatment was a key factor in whether the support provided to the bereaved was beneficial. This readiness is two part, first there is the willingness of the bereaved to engage with the treatment offered and secondly there is the emotional readiness of the bereaved to interact with their bereavement. Participants, in general, believed support should be widely available to the bereaved but argued it worked best when support was sought out willingly and not at the behest of somebody else. Below we present the ways participants seek to promote participation in formal interventions designed to help people deal with their bereavement. Care has been taken to minimise overlap between methods used by

participants to overcome issues faced by clients reluctant to participate in formal interventions. Despite this, some overlap remains as some methods help tackle more than one problem.

6.3.1.1.1 Access

All of the participants believed formal support should be accessible to as many people as possible, and in an affordable manner. Indeed, many of the participants worked as volunteers, providing support for free, or had done so in the past. P5 remarked *"I don't suppose bereavement facilities, things that are there to help people with some things as fundamental as bereavement should cost people any money."*

However, P5 went on to express frustration over the expectation that mental healthcare practitioners provide free support especially when training for qualifications, and felt support should be free to those who cannot afford to pay, and a nominal fee charged of those who can:

> *"People that do the work get paid for doing it because it is necessary, but I also believe in providing services to people who can't afford them. So, maybe what I'm saying is that it needs to be free to a certain section of people who can't afford to pay for it and people that can afford to pay for it even if it is just donation based…I don't know what the answer is to all of that but it is an issue in therapeutic circles. There are too many people being asked to work for too little and being asked to pay for their training which we all are paying for our training no matter what, one way or another. You're getting this body of people who are professionally trained who are then being asked to work for free. Counsellors generally don't get paid until they have done so many free counselling hours. So, when people get something for free, generally, they just take it and don't always place the value on it or don't always think about what they're getting or why – 'oh, it is free, that's fine, I'll just do it.' Whereas sometimes I think if there is a nominal fee, even if it is just a really small fee, people will actually stop and think about why am I doing this, what is the value of it, do I need it?" (P5)*

Similarly, participants reported the level of access to formal support afforded to bereaved people can be beneficial or detrimental, depending on the client and amount of sessions offered. P4 believed increased access to support allowed them to provide support to clients at their own pace and warned a restriction on the number of sessions can lead to sessions ending in an unplanned manner which can be harmful:

> *"I guess I have been quite spoiled in a way not to be restricted by session number because in order to go at the client's pace sometimes that can take a long time. So, I guess the time element is quite important, so you have to be resourced. The organisation you are working for or if you are working for yourself you have to have the capacity to stay with someone because I think there is a risk if you have to then impose 'Oh, we might have to end in a way that hasn't been planned.' – that might be harmful." (P4)*

P3, on the other hand, warned a high level of access to support can prove problematic as clients can become dependent on the support, or can begin to treat sessions as social events rather than therapeutic:

> *"I became a familiar thing, and a safe one, but I'm not sure I was therapeutic, and I often wonder if maybe having less contact would have helped him manage it differently." (P3)*

> *"…in the centre I first worked in we had open ended* [support]*…but they changed from being a therapeutic group to a social group and then it was like they were wanting to do things like go to the cinema together which they could do out and about. They didn't need this space* [therapeutic setting] *to do that…" (P3)*

6.3.1.1.2 Client Driven

All of the participants employed and felt a client driven approach to the support they provided to bereaved people was important. Chiefly that sessions should progress at the pace of the client who should have control over what happens, and how. Participants felt this element of control and the provision of various forms of support (e.g. talking, writing, etc.) allowed participants to be *"proactive and say they want to*

do certain things" (P1), whilst retaining the flexibility to *"make suggestions* [of what to do or talk about] *and with them* [the client] *come to an agreement of what they would prefer to do"* (P1). Participants felt to do otherwise, to tell clients what and how they had to do things would never work. P3 also commented on the fact they leave it up to the client to schedule follow up meetings should they want them, to ensure clients are in need of and receptive to help. Participants believed this client driven approach gave ownership to their clients and made them more likely to participate in sessions as the relationship between participant and client was equal and sessions would go only as quickly and deeply as the client wanted.

6.3.1.1.3 Support Expression in many forms

As mentioned previously, participants sought to provide support in whatever way the bereaved feels most comfortable expressing themselves. Participants reported numerous ways they sought to encourage clients to express themselves in sessions, some used simple prompts and others employed other forms of communication than simply talking to each other. Participants asked clients questions related to impending anniversaries (P1), challenged certain things clients said (P2) or asked them to explore it (P6), and explored different ways for clients to express themselves (P4, P5, P7). The different ways used by participants to facilitate expression included *"chair work"*[17] (P4) which consists of them facilitating communication between the bereaved client and the deceased via an empty chair, selecting and interacting with objects (P4, P3), writing creatively (P5) or non-creatively such as cards (P4), and creating artwork (P4, P7) and memory boxes (P4).

Participants believed these more abstract ways for the client to engage and communicate their thoughts and feelings made it not only easier for the client to express themselves but also represent or interpret what their loss felt like or stumble upon something they were stuck on and struggling to deal with. P7 felt it was *"easier for them* [the clients] *because they were not being asked to speak their words. They were being asked to write them down."* Additionally, P4 supported clients create their own rituals to maintain a connection between the client and the deceased, such as letter writing, and doing activities they once did with the deceased and talking to them. P4

[17] This consists of the bereaved client talking to an empty chair as if the deceased were sitting in it.

believed this helped maintain the relationship between bereaved and deceased, and helped normalise bereavement and assuage any guilt. P6 remarked the more creative methods of expression were not the first *"therapeutic tool"* they would turn to because the client may be reluctant or unsuited to that specific form of creativity. P6 believed reluctance to be creative could be a result of people being told they are not creative, or artistic at school, and over time come to believe they are not artistic and cannot do artistic things. P7, ran an arts group for bereaved people, and found most people were receptive and capable of artistic or abstract modes of expression when introduced to them gradually - clients who participated in P7's art group worked their way from expressing themselves through colour selection and written words, through selecting images of the ocean, to painting and exhibiting the resultant artwork. P7 believed the benefit of this workshop was that people did not have to talk about how they felt or the emotions they were experiencing, they expressed themselves and found validation and understanding through producing the artwork and discussing that. This artistic method of expression, reported P7, enabled one of the clients who was more reluctant to express himself to interact with his feelings and create something through which he could express these to others - which P7 reported he continued to do after participation in the workshop.

6.3.1.1.4 Informed by bereavement theories

Participants often spoke about the work they do in relation to theoretical works on grief and bereavement. P1 commented that they often look at the stages of grief Worden works with [177] when assessing how a client is doing and that it is important to have an awareness of the theory in the background to be able to place the client in the stages. They use these stages to explain to the client their bereavement journey and are keen to point out that the stages can be concurrent, skipped, or revisited. P4 stated one of their favourite models to use is the Dual Process Model [152], they believe people respond to it *"phenomenally well."* They reported that they at times have offered older stage based models such as Kubler Ross' [85] but not in their original form, they do so only in a way that stresses the non-linear nature of grief and bereavement and with reference to the Dual Model Process emphasising these phases may come and go or even change over time. P4 reported in group and individual settings they introduce clients to the dual process model at the beginning and describe the oscillation process and how they can oscillate throughout the day and not just day

to day. Highlighting that nearer to loss bereaved people may be more engaged in loss-oriented activities, and later in restoration-oriented activities.

Many of the participants were also influenced by the works of Klass [81,82] on the continuation of bonds between bereaved and deceased. Participants went into sessions knowing that some people would maintain a relationship with the deceased and this was not necessarily unhealthy, in fact it can be healthy and helpful to recovery. P1 commented they do not use the term continued bonds anymore, but that they do talk with bereaved clients about the place the deceased holds in their life. P1 remarked memory boxes were an *"active technique that I send people away to think about doing"* as a way of remembering their grief, the bereaved person, and as a way to place the deceased or their role in the bereaved person's life. P2 also spoke of a client who had undertaken work similar to a memory box. The client, alongside P2, went back and documented all the milestones in their life that their mother hadn't lived to see, and wrote about how they felt and what it was like at that time in their life without their mum. P2 reported the client felt it was cathartic and that nobody had understood what they had gone through, the client felt this presented them with an opportunity to *"bring mum along in her life"*. P4, as previously mentioned, was aware of the role rituals can play in recovery from bereavement and the continuation of bonds between bereaved and deceased, and often sought to find rituals that could support clients. P4 felt it is very important to appreciate that bonds are not severed when someone dies, the deceased can remain with people for as long as they live *"irrespective of spiritual and religious belief"*. They believed it was *"naïve to think that a bond is severed, or you are somehow going to forget"* and commented people often take umbrage with the phrase *"move on".* P4 believes it is important to look for ways to help the client move forward and work out ways *"to carry the person with you"*. Going on further to criticise earlier theories that talk about *"relinquishing bonds"* that are *"totally incorrect."* P5, however, was keen to stress that it is important to note that there is a point at which continuing bonds with the deceased may for some people become an inability to accept they are dead, which can be unhelpful.

Participants were also keenly aware of and prepared for the individuality of grief and bereavement. P1 noted each of their sessions with different clients could be different and as such it was hard to generalise what a typical session may be like. Stating this was because the needs of each client can be quite different, some may be looking for

information, some may want a different perspective, and some just want a space to talk with a neutral person. P5 further commented on these needs and said, *"you can go in with very specific issues in mind but if you are too specific you are limiting people".* P2 commented that it helps to be aware that the cause of death and the relationship between bereaved and deceased can change how the bereaved reacts to the death. As an example, P2 spoke of a session they had had with a client who was happy their dad had died, and that this does not necessarily mean the client was not dealing with their grief and bereavement or that they had something wrong with them. P5 agreed that it was important to take into consideration the relationship between bereaved and deceased when providing support, and not expecting certain reaction or issues. P5 felt it helped to *"be prepared for the unexpected"* and to avoid expecting anything in particular. P6 also indicated it is important to take into consideration how recent the bereavement is as well as the relationship between bereaved and deceased. P7, similarly spoke of the individuality of grief and expressed how important they felt it was for them to be aware, especially in a group support setting, that *"everybody is an individual and everybody has a different experience. There might be aspects of it that are shared or common…but I think anybody organising group work like that needs to be aware of the individuals and the individuals needs, and the fact that everybody will be on different stages of their grief journey…"* and went on to say they believed that anything that looks at grief and bereavement has the potential to *"push buttons"* and upset people and as such there must be an understanding of this beforehand in the form of procedures for clients to leave and have a break should they need it.

6.3.1.1.5 Provide a Safe Space

All of the participants felt the provision of a safe space was something that contributed to clients benefiting from the support provided. P2 remarked that the first thing they have to do *"is make a client feel comfortable because if they don't feel comfortable, they won't come back."* When participants spoke of a safe space, they meant somewhere clients felt comfortable expressing themselves without fear of judgement or anything they say going further than the room they are in. This could come in the form of a private room in which the bereaved only had to interact with the person providing the support, or it could come in the form of a group session with multiple bereaved people and at least one facilitator. P2 described this more succinctly and

described it as somewhere their clients were *"grateful…to come for an hour every week, a dedicated space, and a dedicated pair of ears that would listen and just listen to her thoughts".* P2 argued if their client doesn't feel safe, they will be "*very reluctant to open up…because it is a very personal thing"*. P1 mentioned their clients often give feedback at the end of sessions on what they think has helped them and *"often it is just having a space to talk to someone who is more neutral"* than friends and family and with whom they can voice things they aren't comfortable talking to family about as the neutral party is seen as more objective and less emotionally involved in the situation. P3 added to this and reported clients often only wanted them to listen, their clients simply wanted a safe space and person to offload in and to. P3 stated they would often see clients in a private room because clients were often uncomfortable crying in public and to ensure they felt more comfortable and safer expressing themselves. P5 ran creative writing workshops and described the safe space they provide as a *"safe environment for them* [clients] *to be who they are"* and be free from judgement related to what they create. Likewise, P7 who ran creative workshops believed one of the key reasons their clients bought into the project they ran was because there was a dedicated room in which they undertook the work in which they felt safe to express themselves and felt free from judgement related to their contributions to the artistic works.

6.3.1.1.6 Contextualise

All of the participants felt it was not only important that the support provided be user centred but that it is necessary that the support offered to bereaved clients is explained and that the client understands what it may entail. P4 explained that in the first sessions they explain to the bereaved: *"This is your space and you can use this time as you want to use it. I will be led by you; do you want to start by telling me what has brought you here?"* P5 spoke similarly of the first session(s) explaining in these they would set the boundaries with the clients and decide on the structure or form of support and communication. P5 went into this further when discussing writing groups they run to support people, stating in the first sessions they explain to clients there is no judgement, and no standards the client(s) need to meet in their writing. P6 referred to these first session(s) as *"contracting"*, which P7 defines in more detail as introducing the client(s) to the space in which they would meet, and setting the guidelines or ground rules - that nothing spoke about in the room would leave it, there might be

tears and that is okay, and if at any time anyone wanted to leave or take time out they can. Participants reported they often used explanatory information to facilitate the creation of a space in which participants felt comfortable expressing themselves in.

6.3.1.1.7 Build a relationship or familiarity

All of the participants also reported that it was important to build a relationship with their clients or to at least become familiar to them, with P2 going as far as to describe the relationship as *"paramount"*. Participants believed this helped not only create a safe space but put clients at ease which made them more comfortable expressing themselves. They also mentioned the relationship or familiarity helped them identify whether the client had something they were struggling to tackle or whether they needed additional help.

Participants reported numerous ways they sought to create a relationship or familiarity between themselves and clients. For P1 one of the ways they established a working relationship with clients was by simply listening to what they had to say. They believed a working relationship allowed them to better spot when something is not working or that the client wants to do certain things, they felt the relationship allows them to *"shift track and ask them* [the client] *what they are needing."* P2 mentioned that having faith in the client's ability to cope with their feelings and bereavement was important to the creation of a working relationship, to respect each client as an individual able to cope with problems in their own way. P2 felt this working relationship made clients more likely to open up and discuss what was really troubling them, and that it gave them something to fall back on if they experienced difficulties during a session - especially when the client has confidence you can support them. Participants also felt allowing clients to come into sessions and talk about lesser issues helped form a bond which allowed clients to explore more private or deeper feelings when they felt comfortable with the participant. P6 summarised this, when they commented *"clients often talk quite superficially for the first few sessions, but that allowance helps build a relationship which later allows the client to go deeper."*

P5 used similar techniques in group writing workshops, and only had clients write poetry in later sessions once the relationships were cemented and clients trusted themselves, P5, and the other group members. P3 commented relationships were harder to form in group settings. P6 also used artwork to build a relationship between

themselves and younger clients. They felt this helped the clients relax and express themselves. Despite the above, P2 reported that over familiarity can dampen the effect of support provided to clients. They warned clients can begin to view support sessions as social events rather than therapeutic ones. P2 also experienced these difficulties in group settings, and commented as people became more familiar with each other and formed relationships they began to treat group sessions as social events and went on to organise social outings afterwards. P2 believed, when necessary, a set number of sessions or duration for support could help reduce these problems.

6.3.1.1.8 Treat the client with unconditional positive regard

Participants also reported they felt treating clients with unconditional positive regard led to the support they provide being more effective. That is that they believe clients are doing their best to constructively move forward with their lives and respect the client's wishes. P3 felt treating clients with kindness and humanity was the most important element of the support they provide. They felt it was important to sit down with clients and let them know they are not alone, what has happened is horrible, but that they are there to help them and acknowledge that they exist and matter. Additionally, P3 believes respecting that the client is able to manager whatever issue it is they are faced with is important. P4 commented that they treat their clients with *"lots of empathy and acceptance of all feelings as and when they arise"*, and explains to clients that there is hope and that P4 will hold the hope that things will change and get better for them for as long as they feel unable to. P4 believes this can help instil confidence within clients and encourage expression. P7 reported they offer words of encouragement to their clients related to their bereavement experience. P5, when working with writing groups, remarked that emphasising to clients that the creative or artistic quality of what they produce does not matter and will not be judged, and that clients are encouraged by P5 themselves and other group members by complimenting the artistic work produced. P1 believes treating people with unconditional positive regard is one of the three keys of counselling to get people who are ready for counselling to open up, alongside being congruent and providing a safe space.

6.3.1.2 *Promote Wellbeing*

Additionally, participants reported clients often experienced difficulties with understanding bereavement, and how they feel or are coping with their bereavement. Participants used a combination of methods to overcome these problems. They provided clients with information about bereavement and normalised it, they listen to what the client has to say and help them understand what they are feeling, and sometimes they reflect the emotion of what has been said back to the client to facilitate this. Participants believed the above could help the wellbeing of the clients, and many of the clients reported they assessed the wellbeing of clients and when necessary suggested additional sources of relevant support.

6.3.1.2.1 Normalise

Participants noted they actively sought to promote a better understanding of grief and bereavement in general and sought to normalise what grief is and what bereaved people may expect. P1 remarked that sessions with clients contain *"an element of educating people as to what bereavement is about and what it means, what the research is, what is quite common"* and to do so P1 gives clients handouts and discusses them with those who wish to. P1 also directs clients to websites and other resources to further educate themselves on bereavement and what they are experiencing. P1 believed clients found these educational materials *"really helpful in terms of understanding the process they're going through because it normalises what they are experiencing"*. Additionally, P1 felt normalising grief was useful because despite the prevalence of death people often do not speak about bereavement and as such are unsure of what to expect when they experience the death of a loved one and can often worry, they are reacting incorrectly. P1 commented on a client they had worked with whose partner expected them to get over the loss of their father and become fun again, and that normalising bereavement for this client helped them feel better about not feeling great. P2 likewise reported normalising is a big part of grief therapy because if it is the first time a person has experienced the death of a loved one it can be overwhelming and having someone explain that this is okay is important. P2 felt giving the client *"permission to feel like it is normal"* to experience a wide range of emotions was important and a common problem P2 was faced with was explaining to bereaved people it is okay to feel happy or sad, or whatever it is they are feeling. P2 reported they emphasise to clients the individuality of grief and that there is no right

or wrong way to grieve. P2 believed normalising bereavement to clients can encourage cooperation, be a huge relief for the client, and ultimately increase the likelihood of clients feeling better. P3 employed similar measures and simply assured clients they were okay, and that bereavement or recovery from grief is a healing process and that what or how the client is thinking is normal. P4 reported they often introduce individuals and groups to what the process of grief can look like, explaining models of grief, describing the oscillation process and how the client may progress through it as the death becomes more distant. P4 also normalises rituals clients may undertake to remember the deceased or continue bonds with them, explaining that it is okay if they do not feel a connection to the deceased at their grave but do so when watching TV and talking to the deceased. P4 commented that a part of this normalisation for them was to dispel the myth of relinquishing bonds to the deceased, and normalising a continued connection between bereaved and deceased. P4 believed this normalisation can help give clients confidence, and help clients understand there is nothing wrong with them in how they react to grief. P7 was the only participant who reported they worked with clients pre and post bereavement. They began to normalise grief for clients before and after loss by explaining what to expect and how to adjust to the loss they will or have experienced. Additionally, in group settings P7 felt when clients saw other people's representations of grief and discussed them, they began to realise other people felt similarly. P7 felt this promoted conversation in a group setting and dispelled feelings of distress as a result of the acknowledgement everybody had experienced similar feelings.

6.3.1.2.2 Hear them out and help understand

Participants reported they often sought to increase their client's understanding of how they feel. P1 believes people feel better when they feel they have been *"heard,* [that] *they have been allowed to tell their story and the story is witnessed"*, further commenting some people benefit as a result of gaining different perspectives of what they have expressed or feel. P1 reported they often reflect back what they hear which can help the client accept and acknowledge the feelings or thoughts they have expressed. P4 likewise reported they employed these *"empathic reflections"* and believed they can help ensure they have understood the client, and that the client understands how they feel, which sets P4 up to offer a normalising statement. P4 believes empathic reflections are not enough by themselves, the client must feel

empowered for the reflections to lead to a change in how the client feels. P3 commented the support they provide is sometimes nothing more than listening to the client, *"it isn't about intervention or action just being someone there to listen…"*, and believed paraphrasing and repeating back what the client has said in a slightly different way can make clients aware of thoughts, feelings, and problems the clients were not aware of. P3 provided an example of when this was the case, P3 was seeing a client who was bereaved and had been diagnosed with cancer, and when asked what their most pressing concern was found it was neither the bereavement or the cancer diagnosis but that they felt unsafe in their home due to their neighbours. P2 likewise believed increasing the client's understanding of what troubled them helped identify potential issues they were unaware of and could work towards overcoming. P5 reported they asked clients to write down their thoughts and feelings, and clients often made sense of what they had written when they gave voice to it - *"sometimes something will just hit them so hard they tear up, or choke up, or just start crying."* P6 often asks clients to unpick or unpack what they express, and that sometimes clients get *"stuck"* and do not *"progress"*. P6 provided us with an example session in which they helped a client who was stuck with something express it and come to a greater understanding which helped them progress. The client had experienced the loss of a child and was experiencing relationship difficulties as a result. The client's partner felt the client was not coping with the loss well, and as a result the relationship suffered. P6 introduced the client to a series of objects and asked the client to select one that represented them and how they are feeling, and another that represented their partner and how they believe their partner feels. Upon doing so, the client was asked to explain their choices, which P6 believes helped the client's sense of self and her sense of her partner. Further arguing that once a client says the words and hears them, they can then come to the realisation of what they really think, and for the client they spoke about it helped them realise they were dealing with the loss better than their partner which helped them move forward. Despite the above, P5 warned that the client gaining a new perspective or understanding of how they feel can be emotionally difficult and can lead to them needing a break or additional support.

6.3.1.2.3 Create a Connection

Participants also spoke of the positive impact a connection between the bereaved and deceased can have, and about the positive impact a connection between the bereaved

and a possession can have. P1 spoke about how the *"memory of a person lasts for a long time"* and how people on some level *"continue to grieve and continue to hold that person* [the decedent] *somewhere in a space in* [their] *mind, soul, heart…or where they think that person has gone"*. P2 spoke about the ways one of their clients created connections to the person they had lost that helped them with their bereavement experience. The client lost their mother at the age of 9 and at the age of 23 sought to learn more about their mum and to create a place for her in their life. The client did this by talking to their mother's friends and family, which helped the client get a sense of who their mother was which P2 believed helped the client greatly. Additionally, the client wrote and spoke to their mother, and created a book that documented the major landmarks of their life and how they felt about them and experiencing them without their mother. P2 and the client, reportedly, felt these processes were cathartic and helped elucidate the bereavement experience. P4 highlighted the difficulties in creating a connection. They spoke of the importance of rituals in facilitating the creation of a connection, and how common misconceptions can hamper it, not everybody feels a connection to the deceased as a result of visiting the grave, for example, and this can lead to feelings of guilt. P4 explains they seek to help their clients find their own rituals and ways of feeling connected to the deceased or clearing up *"unfinished business"*. P4 provided examples of some rituals such as writing letters to the decedent to express things the bereaved wanted to say to the decedent, or to explain how things are, continuing what were important rituals related to the deceased such as writing them a Christmas card or watching Antiques Roadshow and talking to them, and interacting with an object associated with the decedent. P4 stated these rituals can help resolve feelings of guilt and facilitate the transition of the decedent as someone who was here and no longer physically is, describing it as like a bridge:

> *"I think it is very, very important. I think that appreciation just because a person is physically gone, they will be with you for as long as you are alive irrespective of spiritual or religious belief. I think it would be completely naive to think that a bond is severed or you're somehow going to forget…it is about saying we move forward, and we work out ways in which to carry your person with you because of course they are always there…of course whenever we encounter a person just as we might a situation, neurons start*

firing in our brains so you have an actual real electrical representation of somebody and that can be quite nice for people. It is like saying they're still alive in that sense, so even just conjuring up a memory as a way of keeping your person with you." (P4)

Additionally, participants spoke about creating a connection between client and object to help them express their feelings or to represent the person they have lost. P4 stated they often had people select objects that represent the person they have lost or create (paint, draw, etc.) objects that help them express their feelings. P4 believed these helped clients express themselves and identify aspects of their bereavement they struggled with and helped create a connection by creating something such as a memory box that can be interacted with or something the bereaved can carry with them that relates to the deceased.

6.3.1.2.4 Assess Wellbeing

Participants spoke about the importance of assessing the wellbeing of clients in sessions, especially regarding how prepared or ready the client is to progress or undertake certain activities related to their bereavement. P1 reported they try to estimate what *"level"* the client is at and how prepared they are to progress, commenting this helps ensure suggestions made to clients are helpful. P1 explained in the past they had suggested one client create a memory box, the client likewise felt this was a great idea, but upon going home and considering it further realised they were not ready to undertake it emotionally although they still felt it was a good idea. P3 remarked it is one of the hardest things in bereavement support, to assess each clients' wellbeing, and went on to express concerns they had when running a bereavement group. P3 noted they often worried about clients' suicidal risks and the *"awfulness of thinking they have just said this, and you are left thinking 'what are we going to do with this?'"* P3 went on to explain they have to make a judgement on whether to contact the client's GP or other health care professionals. To make this decision P3 reported they would conduct thorough assessments of whether what the client expressed was thoughts or plans, and often discussed with another bereavement counsellor what to do. Often, P3 would ask whether they were thoughts or plans, and often asked the client whether they felt safe – this question itself, P3 reported, was often enough by itself to give an idea of the client's wellbeing. P3 believes

understanding how the client is feeling or where they are at helps them avoid making mistakes associated with pushing them too far or suggesting actions the client is not ready to take. P7 used artwork, created by a previous bereavement group, that depicts stages of bereavement which helped future clients identify and express how well they were doing with their loss. P7 commented that one participant asked them not to show the hopeful image because they were not ready for hope yet.

6.3.1.2.5 Signpost Additional Help

Participants also noted if they believed clients needed additional help, either with their grief or for other issues, it was important to recognise this and point them in the right direction. P2 remarked

> *"sometimes in the course of bereavement counselling, frequently, other issues come in which may mean a referral to another agency like rape crisis or family abuse centres. There is, often, something in amongst all the grief which is maybe making it difficult for the person to acknowledge the grief and to feel genuinely sorry that 'dad' died when actually you're quite glad."*

P2 believes it is important to know when somebody else can help a client, and that additional help for other issues can *"add a little bit into the mix that you're needing at the time."* P2 mentioned one client they worked with for bereavement that they referred to a child abuse centre, they felt the additional support from the child abuse centre facilitated their work on bereavement and vice versa, commenting *"it often makes it easier because you know that that issue is being dealt with somewhere else."* Although P2 reported they are reluctant to work with bereaved people receiving support from their bereavement from elsewhere as they can be working at *"cross purposes"* which they believe can *"actually be quite detrimental."* P3 spoke at length about how important it is to assess a client's wellbeing and about the *"intuitive point"* at which they must make a decision on whether to contact a client's GP or another healthcare professional if they believe the client is at risk of suicide. P5 spoke about the limits of the organisation they had worked with and explained if they felt clients needed more extensive help clients would be advised to seek help at appropriate venues from experienced providers. P7 works with clients pre and post loss and would often advise those they felt had a more complex grief reaction to seek additional help.

6.3.2 Design Opportunities Evaluation

Participants, largely, rated the design opportunities favourably, with almost every opportunity mostly rated as very helpful/useful for a system intended to support the bereaved (see Table 7).

	Not at all	Not very	Unsure/Undecided	Quite	Very
How helpful/useful do you feel it is for it to be available freely online (DO1)?			P5		P1 P2 P3 P4 P6 P7
How helpful/useful do you feel it is for it to be able to output physical and digital possessions (DO2)?				P1 P3 P4	P2 P5 P6 P7
How helpful/useful do you feel it is for it to present Framing Information (DO3)?				P1 P6 P7	P2 P3 P4 P5
How helpful/useful do you feel it is for it to incorporate Degradation into digital output (DO4)?	P5 P6	P3	P1 P7	P2 P4	
How helpful/useful do you feel it is for it to support repeated use (DO5)?			P1		P2 P3 P4 P5 P6 P7
How helpful/useful do you feel it is for it to support varied input (DO6)?					P1 P2 P3 P4 P5 P6 P7
How helpful/useful do you feel it is for it to support private and collaborative use (DO7)?					P1 P2 P3 P4 P5 P6 P7

How helpful/useful do you feel it is for it to require user participation (DO8)?					P1 P2 P3 P4 P5 P6 P7
How helpful/useful do you feel it is for it to employ Sentiment Analysis (DO9)?	P5			P1 P7	P2 P3 P4 P6
How helpful/useful do you feel it is for it to ensure privacy and confidentiality (DO10)?					P1 P2 P3 P4 P5 P6 P7

Table 7: Design Opportunities Evaluated

6.3.2.1 *Promote Participation*

Participants believed a system designed to support the bereaved should be freely available online (DO1), they overwhelmingly reported this would be beneficial and some spoke of organisations they work with investigating and implementing online avenues of support. All of the participants agreed that a system designed to support the bereaved should be available at any time, and all but one (P5) agreed that it should be cost free to end users. P1 and P3 illustrate this in the following quotes:

> *"…that it's available freely and whenever you want to access it…seems obvious to me. That would be very important because you would end up getting more usage out of it if it was free. If people had to pay for it or could only access it at certain times of day." (P1)*

> *"So, it's available freely, this is important because the nature of grief comes, I call it peek a boo – so you're feeling fine, and one minute you're not. So, I would imagine most people would access something like this. Either point, it has got to be free at any time, but also the fact that people's finances are often in disarray and things like that, so it is important with those." (P3)*

Participants believed making support available online would be beneficial as it increases the number of people to whom support is available, and it would allow people to access the support whenever and wherever they need it.

Likewise, the majority of participants felt making such a system free of charge would increase its effectiveness as it would ensure everyone, even those who may not be able to afford other forms of help, has access to it whenever they need it. P1 worried *"I think if it was going to cost you might not get anybody, you might lose a lot of people that could benefit* [from the system]*".* P4 remarked *"I think it should be free because then it is accessible to everybody. It does not discriminate."* P5, however, was torn on whether such a system should be free of charge. They felt many people operating in therapeutic fields were asked to do too much for free but wanted support to be free for those who could not afford it. P5 stated a bereavement support system that was free of charge may be seen as trivial and that a nominal fee could lead to people contemplating why they're using the system, what the value of it is, and whether they need it.

Participants likewise felt a user centred system that provided users with control over what is done and when, and that allowed them to express themselves in a way they felt most comfortable or able would be beneficial, or as P2 put it *"It is all about choice".* Participants spoke favourably about the potential of a CC system to support the bereaved that gave users' control over what was done and how. P2 argued a system that gave users control over the physicality of the possession created (DO2), what input was used (DO6), whether the system was used privately or collaboratively (DO7), and that had users participate in the creation process (DO8) would give users feelings of control. P2 went on to argue these feelings of control would make users more comfortable and likely to use the system, and the involvement of users in the creation process would lead to them owning what is made. P3 expands on this and suggests giving people choices is important *"especially in relation to death"* which people have no control over. They go on to talk about how different things help or hinder the bereaved on different days at different times and that a choice over the materials used as input would help. One participant (P5) commented that in their own experience of bereavement making decisions was hard and required more effort and energy than normal and as such a large number of choices to be made could be distressing. Although they do go on to say that while it may be distressing for a bereaved user to hunt out a physical possession to use but simply writing out how they

feel might be easier. Participants likewise believed the choices given by a system that followed the design opportunities to users would not only increase feelings of control but also comfort. They believed the choices given to users as to the materiality of the possession they created, what input they used, whether they used the system privately or collaboratively, and how they were included in the creation process would allow users to use the system in the way they feel most comfortable and beneficial, and to create possessions they desired. P2 argued these feelings of comfort would increase the likelihood of users reusing the system.

P6 felt a system that provided framing information (DO3), that explained what was done and the user's role, could help not only increase feelings of ownership over the possession but also create a link between the bereaved and the deceased with the newly created possession serving as mediator.

All but one participant likewise believed it was important for a system designed to support the bereaved to explain what it did, how and why, and the user's role in the creation process (DO3). Participants believed this information would be *"central to people, to understand their impact"* (P1) and keep clear the computer and user's roles, and that anything that tackles issues such as bereavement warrants explanation *"so people can understand the process"* (P2). Some participants worried that without information that explained the user's role in the creation process the system could be seen as *"spooky"* (P3) as the possessions created could be reflective of their emotions and users may wonder how it knew that or why it thought that. Some participants commented they believed this explanatory information could be *"quite empowering"* (P4) for the user as a result of showing the part they play in the process, and that it could make the user feel like *"they own it* [the possession created with the system]*"* (P6) which P6 stated they believed could create a link between the user and the deceased. P2 worried that without framing information explaining the user's role in the process less people would use the system due to a lessened understanding of the process and the possession. Conversely, one participant didn't view explanatory information as important. They felt if they used the system and created something *"nice…or to reflect on or something helpful"* (P7) they wouldn't need the explanation as to why the computer created what is has. P6 theorised the more interactive the system was the less important they felt the explanatory information would be as the user's role would be apparent.

P1 felt a system that supported repeated use (DO5) would let people who wanted to dip in and out of the system and access it whenever they wanted to, which is in line with the oscillation spoken of by Stroebe and Schut, and P4. Although, P1 worried that if the system were to nudge the bereaved to use it, that it could become negative and potentially imposing. They felt nudges could help those who were *"very avoidant"* process their grief and bereavement but could become irritating.

Two participants felt that repeated use of the system (DO5) could contribute to a working relationship or familiarity between the system and the bereaved user. P2 felt repeated use could lead to people becoming familiar with the system which breeds confidence, and that it could lead to users being more open with the system and creating more possessions. P5 stipulated they personally would want positive interactions with the system as quickly as possible to show them working with the system had value and warned people could become too familiar with the system and rely on it to be creative in their stead.

Participants likewise responded favourably to DO6 which suggested a system designed to support the bereaved should support varied input such as writing, photographs, social media posts, etc. P5 remarked people use computers in all manners of ways and everybody has different media stored so a system that supported various forms of input would be important to support these individual preferences and requirements.P6, likewise, believed support for various forms of input would be very useful because it supports the individuality of people. P6 felt the different ways people use the internet could trigger a desire to use such a system and whatever the platform or trigger, e.g. a picture on Instagram, they might want to work with that. Adding that those with possessions from the deceased, such as a letter, may want to use that. They argued support for various forms of input would give the system a *"broader usefulness"* and *"makes it more unique and individual for all sorts of people."* P7 argued very similar points, stating *"You might find something on Facebook, you might scan something in, you might plug your camera in, and that just allows you to use all…to be as creative as you like with the resources you have".* P2, likewise, felt support for various forms of input was as important because *"some people are better with one medium than another"* and that supporting clients express themselves in whichever way they feel most comfortable helps *"make a client feel comfortable"* which increases the chances of people using and potentially re-using services. P2 went

on to speak about how DO8, having people participate in the creation process, *"is a ploy we often involve in bereavement counselling"* - clients are asked to write down what they are feeling if they find it *"difficult to verbalise"* because some people find writing easier than talking. Despite the above, P3 warned that arts therapies can be difficult to conduct and problematic in how they may make the bereaved feel. P3 worried the more creative forms of art therapy, and to a lesser degree writing, can *"bypass the conscious memory and getting into the subconscious can open up good understanding but can also open dark places…whether in the long run that is good or not I don't know."*

Participants felt a system that supported various input (DO6), private and collaborative use (DO7), and that protected the privacy of the user and kept any information related to them confidential was important (DO10). They described these as similar to actions they take to create a safe space for their clients to express themselves in. P2 felt a system that supported various input would create a space in which the user felt comfortable and more likely to express themselves. P1 and P6 felt the flexibility of the system to be used privately or collaboratively would contribute to the creation of a safe space. They acknowledged the importance of a private space to express ones most private feelings and the benefits of a space in which families can be brought together through the internet in a safe space to share memories or feelings and create something together. All of the participants felt to protect the confidentiality of what was expressed by potential users of the system was important, as was their privacy. They believed people would be more reluctant to use the system if their privacy was not respected. P1 commented that they felt it was important for the system to be *"confidential and secure as bereavement is a very private thing and people would be unlikely to want to use it if it was not private."* P2 felt similarly, arguing privacy was essential and if people didn't feel safe they would be reluctant to express themselves when using the system as *"it is a very personal thing to open up and express your innermost feelings whether it is to a person or a computer."* P6 went further and argued that the system needs not only to be private but clearly so to the user. The user needs to be aware their privacy is respected and what they input into the system and create is confidential and available only to themselves to do with as they please. P7 felt this was extremely important and giving the user the role of *"gatekeeper"* to whatever they input or create is vital.

6.3.2.2 *Promote Wellbeing*

Participants felt two of the design opportunities could help normalise grief. Many of the participants felt a system that supported repeated use (DO5) would help normalise grief, whilst one participant (P4) felt a system that supported private and collaborative use could help normalise grief. P2 believed DO5 is important as it could be helpful to show a dip in how the user is feeling is normal, and to acknowledge the user may be happier or sadder one day when using the system than another and that there is nothing wrong with that - *"give it another day or so and you'll be back up again."* P3 also felt DO5 could help bereaved users look back on what they have previously created and see the progress they have made regardless of how little progress they feel they have made - they could see there are less down days, or see when down days usually occur. P4 believed this ability for the bereaved user to track how they are coping with their grief could be *"very powerful in informing people and giving them the confidence when they do inevitably have those dips, that they can come out of it again, or that they have not dipped as far as they did the last time".* P5 felt this ability to look back and potentially measure or chart how the user is feeling and compare it with how they felt in the past is similar to some of the work they do. P6 likewise liked the idea of the user being able to see how they have changed, emotionally, through repeated use but warned that once the user had gotten better they would access it less and eventually no longer need it. P4, additionally, believed a system that supported private and collaborative use (DO7) could help normalise grief for the bereaved user through undertaking the co-creative process with other people who have had similar experiences and feelings.

Most participants spoke favourably of the recommendation that systems designed to support the bereaved should reflect the users' emotion in what is created by the user and system (DO9). P2, when first shown DO9 responded *"That is the point, isn't it?"* Further adding they believed something that reflected how the user was feeling when they created something with the system, that was used repeatedly (DO5), could help normalise bereavement by showing dips in how they feel are normal and that DO5 and DO9, together, were similar *"ploy*[s]*"* to those used in bereavement counselling - asking people to write down how they feel if they find it difficult to verbalise, which can then be reflected on at a later date.

P2 believed this feedback is important as it is *"the whole point of counselling…to help people reflect and understand what they are feeling or what they have disclosed to you, and you are doing it on the computer instead of sitting here talking to me."* P3 responded similarly and commented *"This is huge, I think. Analyse it."* P3 felt reflecting the emotion of the user was similar to paraphrasing and reflecting back what people maybe don't realise they have said or experienced. They believed this could be *"very powerful."* Although they did stipulate it should be used or implemented with caution. P4 found it:

> *"fascinating, the thought that a computer could almost be doing the empathic responses…I know how powerful that can be. If that is possible, to give language to something that might feel…to the person they don't really understand. I think that has the power to really validate and help understand."*

Although, P4 did also comment that they were *"doubtful"* it could be done *"because empathy is so complex, but I'd like to be proved wrong."* P6 felt it *"made sense"* for the system to reflect emotions and could see how it could help in the long term by showing how the user has changed. P6 considered this aloud *"What if it did not do this?"* and decided *"No, then it is flat. I guess it needs to, because if it did not it might be completely the wrong kind of thing that it comes up with."* Further commenting *"It does need this, otherwise they won't continue, well I wouldn't. If I'm trying to get some angry or sad feelings out even if that is unconscious…if it does not analyse emotions how can it create helpful output? I'm going to go with very* [helpful] *on the basis that if it does not do that…I don't think it is going to help."*

Despite this, P6 was concerned with the accuracy of emotions reflected, they believed if it was not accurate people would not use it but that it did not have to be 100% accurate - *"frustrated rather than irritated is close enough, frustrated instead of sad is not good."* P7 was unsure how helpful it would be because they had never experienced something like it, but upon further contemplation felt it made sense and could be helpful. Despite the above, P1 was unsure how helpful this feature would be, and found it hard to believe a system could *"analyse how deep my sadness is or how shallow it is or whether I'm feeling guilty without my saying that."* P1 did not think a computer could capture the nuances of emotions expressed by the bereaved. P5

likewise worried about the accuracy of the system, *"what happens if the computer gets that wrong?"* P5 went on to argue people often do not write what they mean or what they are ready to tackle and worried that if the computer got the emotions wrong or reflected something the person was not ready to tackle the user may need additional support or help. Despite this, P5 did believe it could work for some people and it could be easier than going and speaking to a person but believe there were *"so many areas for that to go horribly wrong."*

Participants, when discussing the design opportunities felt anything that contributed to a connection between the bereaved user and the possession co-created by them and the system could be beneficial. P2 stated they believed user participation in the creation process (DO8) not only gives the bereaved their place but also control, and the very act of including them will increase feelings of ownership over what is created. They went on to suggest if they didn't feel included in the process the user may just shrug off whatever is created. P6 felt a system that gave users the choice to have output as physical and/or digital (DO2) would support the creation of a connection between person and possession by providing the user with a possession they feel most affinity with. For P6, this was a physical possession which they believed could be seen as a tangible representation of the physical person, although they acknowledge something intangible such as music could be just as effective. P6 also felt a system using framing information (DO3) could increase feelings of ownership and a connection between bereaved and decedent, they felt it would emphasise a link between user and deceased rather than computer and deceased and that feelings of ownership would make the output more meaningful. Comments made by P7, who oversaw a creative arts group for bereaved people, were in line with P6's reasoning. P7 spoke about a series of paintings created by a bereavement group they worked with, and how the paintings helped their clients. Not all of the clients felt confident in their artistic abilities to paint or draw, but they contributed in the idea generation for the paintings and with the physical framing of them which led to feelings of ownership. The connection to the paintings felt by all of those within the bereavement group contributed to feelings of pride in the bereaved.

Participants felt a system that supported repeated use (DO5) and that reflected emotion in what it created (DO9?) could help assess the wellbeing of bereaved users. P2 believed a system that implemented both design opportunities could help users chart

their bereavement experience, commenting *"Grief is not a thing that goes like that* *draws straight line with finger*, *it goes like that* *draws a line with peaks and troughs*.*"* Similarly, P2 believed the ability for a bereaved user to see the peaks and troughs of their bereavement could help normalise the bereavement experience and help them anticipate problematic periods such as Christmas. P3 believed these design opportunities would allow people to go back over what they have made and see the progress they have made even if they don't feel progress has been made. Arguing it could allow users to see there are fewer down days and identify when those days were. P4 commented this could act as *"a sort of tracking system"* which they believed could be *"very powerful in informing people and giving them confidence when they do inevitably have those dips"* that they will come out of it or that it was not as big a dip as last time, *"so, I think that is really good."* P5 also believed it could be useful because it would allow people to be more able to measure where they were and how far they have come and compare how they feel now with how they did back then, and chart how well they are doing and see their progress. P6 also felt the design opportunities would show the user they are changing and how they feel is too, and commented that to some extent they think it is necessary but in the long term, as people get better, they would access it less because they would not need to. P6 believed it would be very helpful as it would allow the user to go back and revisit where they were with the original loss and notice there has been a change, and see that even if they experience difficulties they are not necessarily back at the beginning - they have still made progress. P6 believed this could help with subsequent bereavement, as users would have an idea of what the process of grief and bereavement can look like. P6, when discussing DO9, believed being able to compare and contrast with how the user used to feel with how they feel subsequently was helpful, and could be especially so in the long-term if the bereaved chose to look at the overall process. P7, when discussing DO9, commented they thought it was *"really good"*, they believed *"whatever they* [the client] *is working with it* [the system] *will pick up on things and it can then maybe give them a health check, and maybe after 4 months if you are still using all the angry, black, red, grief language and the system is picking up on that and as you say it might be time to go to the GP."* P7 remarked DO9 could work in a similar way to them, it would let the system give the client a health check every time they use it. When discussing repeated use (DO5) P7 also commented it could work in a similar

way, and allow the client to think *"You know what, I am making headway, and it is not as bad as I thought"* - P7 felt this was *"very important."*

6.3.2.3 *Create Lasting Mementos*

All of the participants felt possessions created to support the bereaved should be lasting. When shown Design Opportunity 4, create digital possessions that degrade, P2 asked "*Why would you want that?"* This sentiment was prevalent. All of the participants felt the advantage of digital possessions was that they don't degrade, they are safer, and longer lasting. Despite this, P1 could see the potential for degradation to mimic reality but felt it wouldn't be beneficial:

> *"I can see that maybe there is a concept that maybe over time our memories degrade and over time the intensity of feelings maybe gets lessened, so perhaps the computer is trying to mimic that degradation process but I can imagine that feeling quite upsetting to people. That something they thought was more secure and had more longevity would degrade."*

P2 agreed with the above and explained bereaved people could be upset if they went back a year later to look at something and it was not as they left it. Although P2 added it was difficult to say whether digital degradation would be helpful or not, and that it would depend on the level of degradation - how quickly the possession would degrade. P4, started off thinking digital degradation could add a sense of reality or realness to the digital possession, but upon further reflection felt it could be seen as the person or connection to the decedent dying again.

6.3.2.4 *Envisaged Use*

Participants spoke favourably about the application of a system designed to support the bereaved. Many stated they could see how it could help but P5 was worried people could become reliant on the system. P2 felt such a system could prove helpful for the interviewer's age group, *"youngsters up to about 30",* and that it could prove beneficial in schools. P2 believed schools lacked adequate support for children undergoing mental health issues, and that the interactivity, and personal and private nature of a system that employed the design recommendations could help bereaved children express themselves and prove therapeutic. P3, had spent time working as a nurse, found the prospect of such a system *"exciting…new and innovative"* and

believed it could be beneficially used *"on the wards"* where they had experienced a lack of support for the families of deceased patients. P4 believed it could be beneficial in a home setting and felt it seemed *"a very positive way…people could be guided and given support in their grief just as they are in a therapeutic context. It is almost like a transferring of some of that into where a person has more potential to feel alone in their grief, I think. It potentially has a real value."* P4 also believed it could be beneficial in a group setting, but felt there was no replacement for human to human support. P4 remarked such a *system "has the potential to reach far more people and to do a lot of that work around educating, being alongside people, helping them to process and accommodate their grief."* P5 felt it should be used only in an intervention context with a therapeutic safety net. They felt users should be trained on how to use it, and have someone on hand in case they experience negative emotions. P5 was worried people may become reliant on the system. P7 was also excited by the prospect of such systems and felt it could be useful in a group setting and that it could get *"creative juices flow*[ing]*."*

6.3.2.5 *Participant Identified Design Opportunities*

Participants felt it would be helpful to have some form of explanatory information presented to the person before they use the system, explaining what to expect, and that using the system may evoke difficult emotions or feelings. P3 remarked the system could explain to users *"should you be distressed by this, these are the people to contact and you can get support from dah dah dah."* P7 similarly commented that a *"health warning"* would be useful, that explains the system is intended to help, not replace whatever form of formal support they may require. Participants likewise felt the system should present users with information on bereavement, to normalise, and contextualise how the user may be feeling. P1 believed that if the system could detect how the user is feeling, and explain that X number of users feel this way, or this is a common feeling in the bereaved, that it could be useful in educating the bereaved and also affirm what they have expressed. P2 felt similarly, and remarked *"all the time we should be normalising",* as did P3 who felt it would be helpful to explain *"it might be normal to feel a little bit unsettled"*. P4 went into this further, and suggested the system should explain that there are reactions to grief and bereavement that are similar between people but not everybody is the same, that there is no set timescale in which you must deal with your bereavement and grief, and that should explain the differences

between grief and depression so users can better identify whether their grief is evolving into depression.

In a similar vein to P4's desire to inform users of other mental health issues that may arise, all but one participant commented that a system intended to support the bereaved should signpost additional sources of support for the bereaved. P1 believed links to other websites or helplines run by organisations such as the Samaritans would be helpful, and felt the system could have almost a warning message, *"if any of these things upset you, go to these websites or these helplines or seek additional support and help."* P2 felt it would be useful if the system could detect other issues that may arise or be linked to how the bereaved person is feeling or coping with their bereavement and warn them *"You may be experiencing X, you may wish to contact Y, or Z"*. Most of the participants made similar comments, P1 felt it would be helpful if the system could *"pick those things up"* and inform the user, and P4 felt it would be beneficial identify *"that these can be signs that something is becoming more problematic".* P6 remarked that repeated use could help identify issues that arise, if the bereaved user begins expressing more negative thoughts or feelings. P2 felt signposting help in these cases could be very beneficial in cases of bereavement where the bereaved has experienced childhood trauma or abuse at the hands of the deceased. P4 felt signposting additional avenues of support could help those who are experiencing grief or other mental health issues that are becoming more problematic or that user feels are not getting better or are getting substantially worse. P5 felt if the system were used in conjunction with mental healthcare practitioners and could flag to them that the user requires additional assistance that this would be beneficial. P6 also remarked that high levels of interactivity and control over what is created, and the ability to re-create or regenerate what is created would be good. They felt this would help create feelings of ownership or attribute meaning to the possession, and as such would reduce the necessity of explanatory information about the system. P6 also felt it would be beneficial if the system could track multiple bereavements, so as to show the bereaved user that they are not dealing with their loss worse but are struggling more because it has awoken negative feelings associated with a previous loss.

6.3.3 Summary of Results

Participants, in overlapping ways, all sought to support clients to express themselves and explore what they express to promote their wellbeing. Participants, to facilitate expression and exploration, sought to provide:

- Support informed by prevailing bereavement theories and an understanding of what will be expected of the bereaved
- A safe space for the bereaved to express themselves within
- A non-judgemental person to talk with about their issues
- An appropriate number of sessions with the client, each of which is informed by prevailing bereavement theories
- Client driven support that progresses at the client's pace in a way they feel most able to express themselves (e.g. talking or writing)

Participants felt that by providing support in line with the above that a working relationship between bereaved and mental healthcare practitioner could be formed that would lead to fruitful sessions in which the participant feels able and comfortable to express and explore what troubles them. Participants, to ensure the wellbeing of clients, would also seek to educate clients on bereavement and grief to normalise how the client feels especially when clients are undertaking actions they fear judgement over (i.e. continuing an asymmetric relationship with the deceased). Participants reported that they continually assessed the wellbeing of their clients to ensure progress was being made, and to inform how deep sessions could go. This assessment also helped participants identify when clients were experiencing additional problems that required separate support (i.e. childhood abuse), upon identifying additional problems participants reported they would help clients find suitable support for those issues.

The majority of participants reacted to the design recommendations they were asked to evaluate positively, with most being scored as either quite or very helpful or useful in supporting the bereaved. The most contentious design recommendation was that the system produce digital possessions that degrade in a similar fashion to physical possessions. Participants, mostly, felt this defeated the purpose of digital possessions (long lasting backups) and some worried it could mimic the degradation of the

deceased. Although one participant theorised such mimicry could prove beneficial for some. The only other recommendation to score anything lower than unsure/undecided was the use of sentiment analysis. Participants reported they were worried about sentiment analysis and its accuracy, fearing that inaccurate readings could be detrimental.

6.4 Discussion

Participants were largely in favour of the recommendations they were presented with and were interested and excited by the prospect of a system that employed the recommendations to support bereaved people. Participants believed many of the design recommendations would lead to the creation of systems that could fulfil many of the same tasks they do when providing support to the bereaved. Although there was some uncertainty amongst participants about some of the recommendations. The one participant (P5) who was unsure whether such systems should be freely available online was unsure because they felt mental healthcare practitioners were asked to do too much for too little (or free) and a small cost for those that could afford it would potentially contribute to users taking the system more seriously. The implementation of CC systems intended to support the bereaved could lessen the load of mental healthcare practitioners by providing informal support to those who do not necessarily require formal interventions. In a similar vein, participants worried about overreliance on such systems. This suggests systems designed to support the bereaved may benefit from a suggested program or timeline of use, much like formal interventions offered by mental healthcare practitioners. Such a program could provide recommendations on how to use the system, and a timeline for doing so, whilst acknowledging it is nothing more than a recommendation and users can use the system as they wish. A program suggesting an appropriate level of use (which would have to be determined) would align with the well-received recommendation of supporting repeated use. The most contentious recommendation for everyone but P2 and P4 was the suggestion to incorporate degradation into digital possessions. Some of the participants felt this could be beneficial and provide a smaller loss for the user to overcome which could increase confidence related to their ability to adapt to their bereavement. Despite this, the majority of participants felt degradation of digital possessions defeated their purpose, to preserve possessions, and risked upsetting the bereaved by either

mimicking the degradation of the deceased or through the loss of what may become a possession they are attached to.

Despite participant receptiveness towards the majority of our design recommendations, there were mixed feelings regarding how such a system should be used and in what context. Many felt the system could be used in a bereavement context, whilst some worried it would require supervision in case users experienced emotional distress. This suggests that the context in which such systems are used, and how are important considerations. One participant suggested bereaved individuals should receive training prior to the use of such system, and this is a potential way potential negative experiences with the system could be minimised. The combination of a warning message explaining the system is designed to support you but that you may experience emotional distress and upset, and that has information on bereavement in general and information on who to contact and how if you do experience distress could lead to more positive interactions with the system and ensure the wellbeing and safety of users. Training on how to use the system, provided through an online tutorial or in person, could again lessen potentially negative interactions with the system and ensure users are cognisant of how the system works, their role in the co-creation process, and avoid unexpected user errors.

These findings have contributed to the refinement of the design recommendations evaluated in the study into two design goals (1) support self-expression, and (2) promote wellbeing, with some overlap between the two areas. Five design objectives to support self-expression have been identified:

1. Make support available
2. Give users control
3. Explain the process
4. Support individual and collaborative use
5. Protect the privacy and confidentiality of users

The above objectives can also promote participant wellbeing, for example, through the validation or sense of satisfaction experienced upon creating something. Aside

from this overlap, four design objectives were identified that are focussed on promoting wellbeing:

- Normalise bereavement and grief
- Provide an interactive experience
- Create reflective possessions
- Create meaningful, lasting possession(s)

6.4.1 Make support available

The results from our interviews and the expert evaluation of the design recommendations suggest CC systems designed to support the bereaved should be affordably available online to those who need it. This aligns with the call for more community (non-formal) based support for bereaved people [92] and will lead to bereavement support becoming more widely and easily accessible. An affordably available system online would allow bereaved individuals to access help as and when needed and could provide a distraction from the negative feelings often associated with bereavement. This could support bereaved individuals to engage and disengage with their grief and bereavement when necessary, in line with the Dual Model of Bereavement [152]. Additionally, such a system would allow bereaved individuals to access support from the comfort of their own home, or privately on their phone or tablet on the go. Despite this, some of the data suggests measures should be taken to ensure people do not become reliant on the system, and that they value their interactions with the system. To avoid reliance on the system supplementary information could be presented alongside the system that explains the system should not be used as a long-term replacement for human interaction. Additionally, a suggested program of use could be presented to users that suggests, for example, participants use the system for 15 – 20 mins a day, 3 – 4 times a week, for 3 – 5 weeks, which has proven therapeutic in a journaling context [133]. In terms of valued interaction with the system, such a system should not have a cost associated with it for those who need it as suggested by one participant. Factors that contribute to valued interaction with the system will be discussed in many of the following design objectives.

6.4.2 Give users control

For many of the participants some of the recommendations they evaluated came under the guise of giving the user control or supporting user preference. These include the options for the user to choose the materiality of the possession to be created, what input is used to create it, and whether the input and output possessions are shared with others. Participants theorised these feelings of control would contribute to users feeling more comfortable using the system, and more likely to use the system and feel ownership over what is created using it. P3 reported feelings of ownership are increasingly important in response to bereavement because the bereaved have no control over the loss or their grief. Participants believed a system to support the bereaved should support individual choice, and that the options listed above would give users sufficient control to create what they want, when they want, using what they want, that can be shared with who they want. A system that gives a user the choice to create digital or physical possessions supports the user to create a possession they are more likely to value and connect with. Additionally, it would allow users to create possessions supportive of intended interaction frequencies – physical for less interacted with possessions, digital for more frequently interacted with possessions. Participants likewise agreed such a system should support varied input. The ability for users to select what is used as input, something they have written themselves for that purpose, something they have previously written, or something created by or related to the deceased could increase the value attributed to the possession created. Additionally, the ability to create input for the system, or choose pre-existent input supports users to engage and disengage with bereavement and grief as and when necessary. The input created by users and the possession output by the system should only be presented to the user, and the option of whether to share either left entirely up to them.

Despite this, too much choice can prove problematic. One participant (P5) remarked on their own experience of bereavement and how difficult it can be to make small choices or decisions in the midst of grief. The choices presented by CC systems to support bereaved people, as such, should be limited or guided. CC systems to support the bereaved could ask whether users want to use something that already exists as input, or create something new to be used as input, and from there suggest things to create such as a written memory of the deceased. This would keep the user in control

and use the limitations of the system in a positive way to limit the choices available to the user to mitigate the risk of users feeling overwhelmed or unable to make a decision. User control can be felt by giving the users options that dictate what is made and how, but participants agreed explanatory information can also contribute to feelings of control.

6.4.3 Explain the process

The use of explanatory information (framing information), participants believed, could contribute to feelings of control and ownership over the creation process and the possession created. Framing information has been widely used in the arts world, and also in CC research (see Chapter 2). Framing information gives context to systems and/or possessions, it can explain a piece of art, a co-created possession between human and AI, and explain the system and user's role in the creation process. Participants felt it was imperative that users understood their impact, and the process, especially in a bereavement context. The prospect of using sentiment analysis increased the importance of explanatory information for the participants. They believed without it, the co-created possession could be seen as *"spooky"* (P3) if it reflected their emotion, but with the explanatory information it could be *"empowering"* (P4). Despite this, some participants theorised that with increased control and interactivity the amount of information required is lessened. As such, CC systems that are more autonomous should make use of detailed and comprehensive framing information, while more co-creative systems can make use of more general, less comprehensive framing information.

6.4.4 Support individual and collaborative use

The system, by allowing users to use the system privately or collaboratively, gives the bereaved user control over who (if anyone) they express themselves in the presence of. This could contribute to the creation of a safe space in which the bereaved user feels comfortable expressing themselves, and free from judgement which is especially important in creative tasks. The ability to use the system privately could allow users to express their raw emotions and co-create deep, meaningful possessions with the system, which could give the user insight into how they are feeling and facilitate communication with others. The ability to use the system collaboratively could lead to the creation of possessions that more fully reflect the deceased, and that lead to the

transmission of stories between the bereaved that give them a fuller sense of the deceased. Mental healthcare practitioners could also make use of the collaborative nature of the systems, and work alongside bereaved individuals to facilitate self-expression and the creation of meaningful, reflective possessions.

6.4.5 Protect the privacy and confidentiality of users

Participants agreed that it was paramount that a system designed to support the bereaved establish and maintain the privacy of its users and the confidentiality of what they express and co-create. A system that protects the privacy of its users, and keeps what is shared and created confidential will contribute to the creation of a safe space in which users feel comfortable expressing themselves. Should users choose to, they could take it upon themselves to share their input or output with others, but the system should leave that decision to the bereaved user. The ability to share the input or output should not be implemented into the system to avoid accidental sharing, but the user should have access to both input and output which they are able to take a photograph of or copy and paste to whoever they choose. Ignoring the privacy and confidentiality of users would create a system users would not feel comfortable or want to use, and if they did may actively lead to emotional distress or upset. An emphasis on privacy and confidentiality, like in formal interventions, would serve to create a safe space in which people feel comfortable expressing themselves. If the system was not private and confidential not all bereaved users (if any) would be comfortable using the system.

6.4.6 Normalise bereavement and grief

Framing information related to the system and possession is not the only form of contextualising information that should be available on a CC system to support the bereaved. Systems to support the bereaved should have information on bereavement and grief for users to read. This information should seek to inform users about bereavement, grief, and dispel common myths. The information presented to users could stress that bereavement and grief are highly individualistic experiences and reactions, and that there is no right or wrong way to grieve. This could contribute to users' feeling more comfortable about how they are feeling and using the system and could ward off potential distress or upset and validate how they are feeling. Information related to the currently prevailing bereavement theories could also be presented, in an understandable manner, that explain it is okay to maintain an

asymmetric relationship with the deceased, and that avoiding bereavement and grief can be just as beneficial as engaging with it. This information could similarly help bereaved users feel more comfortable about their bereavement, as well as about using the system.

Another way of normalising bereavement and grief reactions that participants spoke positively about was systems that supported repeated use. A system with which bereaved users co-create emotionally reflective possessions on separate occasions over a period of time has the potential to normalise the individual's bereavement experience and grief reaction. A bereaved user who uses such a system could see that over time the possessions they co-create become more positive over time but sometimes become negative on anniversaries. This could show bereaved users that they can and are adapting to bereavement and overcoming grief, and that it is normal to experience upset from which they can recover again. This could allow users to predict when they might experience emotional upset or distress related to their bereavement and could help users with subsequent bereavements. The system could show them that they have adapted to and overcome one bereavement experience, which suggests that they have the capacity to overcome the next.

6.4.7 Provide an interactive experience

User interaction with the system is important on a number of levels. Participants agreed that a CC system that requires users participate in the co-creation process would be helpful, they felt the act of inclusion would increase a user's feelings of control over the process, and the ownership they feel over the co-created possession. Participants went on to suggest that if the bereaved user was not involved in the co-creation process, they may just shrug off whatever is created. Additionally, involving the user in the co-creation process by asking them to write input that inspires or dictates what is created presents bereaved users with the opportunity for self-expression. Self-expression is seen as one of the most important elements of adapting to and coming to terms with bereavement and grief [92]. The opportunity for the bereaved to express themselves could also facilitate the exploration and processing of feelings, acceptance of loss, and the maintenance of a connection between bereaved and deceased – all of which are beneficial for the bereaved [81,82,152,177].

6.4.8 Creative reflective possessions

Participants believed the use of sentiment analysis to create emotionally reflective possessions was similar to methods they employ to support bereaved people – empathic reflection. Participants agreed that a system that calculates the sentiment in user input and creates output reflective of the emotion it has calculated is similar to paraphrasing and reflecting back what clients have said. They believed this could help people comprehend what they have said or are feeling but cautioned that there needs to be a certain level of accuracy. To ensure sentiment analysis is accurate users could be asked to rate how accurate the sentiment analysis was, which the system could learn from and re-create more accurate representations of how they user feels. Despite this, one participant was worried people do not always write what they mean and that the system may reflect something the person is not ready to tackle which could cause distress. The first issue is one also faced by mental healthcare practitioners, encouraging people to open up and express themselves. A CC system could overcome this problem in a similar way to mental healthcare practitioners by providing a safe space in which the bereaved user can express themselves, and over time hope the user becomes more open to meaningful self-expression. Additionally, a CC system can make suggestions to users on what to express, a CC system could have users select a mood or emotion and from there suggest topics or lyrics depending on the goal of the system. This could help users express themselves, and in the case of suggested lyrics could lead to users discovering emotions or feelings they were previously unaware of. Regarding the second issue, the system reflecting something that could cause distress or upset, this is not always a bad thing and can lead people to accepting and adapting to bereavement and grief, and in cases where it does prove more problematic signposts to other sources of help could help minimise distress or upset.

6.4.9 Create meaningful, lasting possession(s)

The introduction of degradation into digital possessions appears volatile, it has the potential to very negatively impact bereaved users through the loss of a newly created and meaningful possession or through the more symbolic re-loss of the deceased. Possessions degraded past the point of recognition could also limit the level of reflection they inspire. As such, the possessions co-created with CC systems should be long lasting, to ensure bereaved people can treat them as they would other cherished possessions. Long lasting possessions, digital and physical, could also serve as a

continuing link between the bereaved and the deceased which could support the continuation of bonds and help with bereavement and grief. Despite this, degradable digital possessions may increase the value and meaning attributed to them and could help the bereaved come to terms with loss through mimicking the degradation of memories or the deceased over time.

6.5 Conclusion

This chapter provides answers to the third research question: How can CC systems be designed to reflect the approach taken in formal interventions to support the bereaved? By exploring (1) the experiences and support provided by mental healthcare practitioners to bereaved people, and (2) their receptiveness to the 10 design considerations identified in Study 1 (Chapter 4).

We found that all 7 participants were excited by the prospect of CC systems designed to support the bereaved and argued 9/10 of the design recommendations for CC systems to support the bereaved could be helpful for bereaved users. As a result of the semi-structured interviews we achieved a greater understanding of the support provided to bereaved people, and as a result of the evaluation of the design recommendations we achieved a greater understanding of how these could help or hinder bereaved individuals. This increased understanding has allowed for the refinement of the 10 design considerations evaluated in this study into a series of 9 design objectives that seek to achieve two design goals: (1) support self-expression, and (2) promote wellbeing.

We believe the design goals and objectives for CC support systems identified as a result of this study could lead to the creation of more supportive, therapeutic technology. This CC technology has the potential to fulfil similar roles and undertake similar activities as mental healthcare practitioners by encouraging self-expression, normalising bereavement and grief, and reflecting or paraphrasing what the user has expressed.

In the next chapter we report on research that explores the use of a CC system in a bereavement context to elicit insights into its therapeutic potential, and the user experience of using a CC system in such a context.

Chapter 7

7 Study 4: User Experience of a CC system in a bereavement context

7.1 Introduction

As a result of Study 3 (Chapter 6) we identified a series of design goals and objectives for the creation of CC systems intended to support the bereaved. This chapter documents the findings from the fourth (and final) study of this thesis, in which we sought to explore the user experience of a CC system (ALYSIA) that meets many of the design objectives identified. To do this we introduced bereaved users to ALYSIA through a series of short introductory videos. Prior to, and after, co-creating the song participants were asked to complete the WEMWBS to determine whether there had been a measurable change in their wellbeing score. After co-creating a song, participants took part in short interviews intended to elicit an understanding of their experience of the system.

This exploration allowed us to test the impact of a CC system that is reflective of the design objectives identified in the previous chapter and to determine whether by meeting these the system can support self-expression and promote mental wellbeing.

The following overarching research question guided the study:

> RQ4: *In what ways do users find CC systems helpful in engaging with their bereavement experience?*

7.2 Study Setup

7.2.1 Procedure

An evaluative research study *("user testing")* was conducted to explore whether the process of co-creating a song with a computationally creative system can help bereaved people interact with their bereavement. This involved the researcher introducing participants to ALYSIA through a series of three short videos [18], and then asking them to create a song related to their bereavement. The researcher was present during the creation of each song and feedback suggested participants were comfortable with this. Prior to using ALYSIA each participant was asked to complete the Warwick-Edinburgh Mental Wellbeing Scale (WEMWBS), to determine their wellbeing prior to using the system. Participants, after using ALYSIA to create and listen to a song, were again asked to complete the WEMWBS to determine whether using ALYSIA had led to a change in their wellbeing. After completing the WEMWBS for the second time, the participants took part in semi-structured interviews (see Figure 17 on the next page for an overview). The semi-structured interviews sought to elicit insights on their experience using the system, listening to the song, engagement with bereavement, and their receptiveness to such systems.

[18] Participants were shown a video that introduced them to the system (https://www.youtube.com/watch?v=K8OKzI9d4mo) and the first three videos in AYLSIA's tutorial playlist (https://www.youtube.com/playlist?list=PLnDEAvl-9h527LqG5SDa_7Iro9k63ahU7)

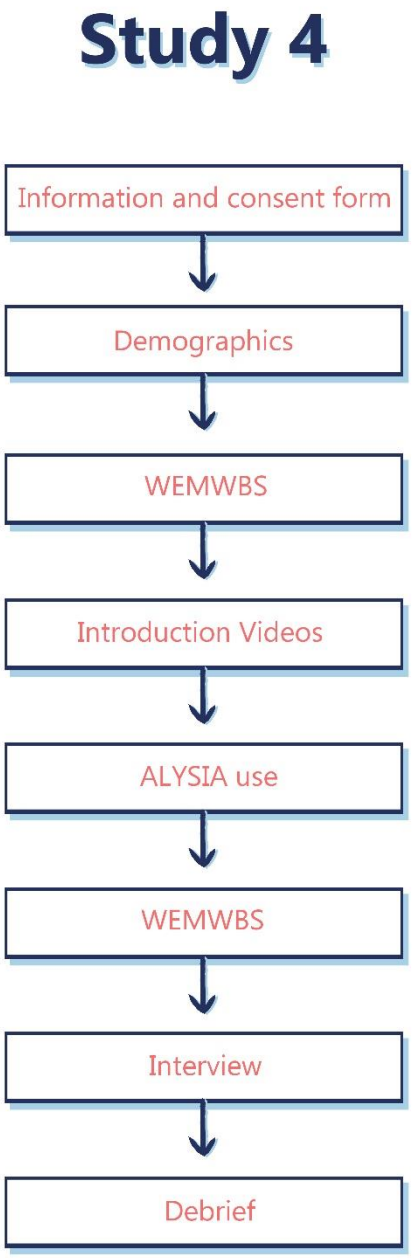


Figure 17: Study 4 Study Flow

7.2.2 ALYSIA

ALYSIA (Automated LYrical SongwrIting Application), is a co-creative songwriting app available on the iOS store as a freemium app. The reason ALYSIA was used for this study is threefold. Firstly, ALYSIA has been designed to support self-expression (in a creative context) and as such is likely to do so in a bereavement context. As a result of this ALYSIA meets many of the design objectives through which we posit

systems can support self-expression and promote mental wellbeing, these being that AYLSIA is: widely available, gives users control over what is created, as a commercial app has a duty to protect the privacy and confidentiality of users, provides an interactive experience, and has the potential to facilitate the co-creation of reflective songs that have the potential to become meaningful possessions. Secondly, because ALYSIA is a finished product with a professional development team maintaining it which reduced the likelihood of users encountering issues when using the system (which could be more problematic in a bereavement context). Thirdly, as a result of collaboration with ALYSIA's CEO Dr. Maya Ackerman who offered to provide technical support if necessary, and provided a premium account for the duration of the study.

Free users of ALYSIA can create short songs with the system, whilst premium users can create full songs with the system and are given more control over what is created. ALYSIA has undergone significant development in the last five years [1]. Since its inception, the co-creative system has aimed to enable everyone, irrespective of their level of musical expertise, to express themselves through songwriting.

The process initiates with the user selecting a backing track in a genre of their choice (choosing from amongst Rock, Pop, R&B, Country, or Jazz). The user subsequently inputs topics to guide lyric creation or chooses topics from a list of common options (e.g. love, moody, and anger). The first co-creative process involves lyrics creation, which can be initiated by either selecting a lyrical line created by ALYSIA (based on the user's topic), or having the user input their own lyrical line. ALYSIA generates suggestions for subsequent lines based on previous selections/inputs, adapting to the user's style if they choose to write any of the lyrical lines.

The next step involved the co-creation of top line melodies, which fit with the lyrics and the underlying musical track. The melody system proposes different ways in which the lyrics can be sang, allowing users to choose from its suggestions, edit them, or input their own. Finally, the user may record the song in their own voice or choose a male or female singing in-app voice. The voices can also be used to supporting learning a new vocal song, or to duet with the users. See Figure 18 and Figure 19 on the next page for an example of the melody selection screen with all melodies selected,

and of the karaoke screen presented to users when the song is sung by the user or system.

Figure 18: ALYSIA Melody Screen

Figure 19: ALYSIA Karaoke Screen

7.2.3 Participants

For inclusion participants had to be over the age of 18 and speak English fluently, this was to ensure participants understood what they were asked to do and the potential implications of participation. There were no exclusion criteria set for gender, country of origin, etc. We recruited a total of 7 participants through contacts made in previous studies, and snowball sampling. This snowball sampling meant some of the participants were bereaved of the same person. Participants in Study 1 (Chapter 4) during their debrief were asked if they would like to be kept abreast of any publications that resulted from that study and about the PhD project in general. Two participants from Study 1 took part in this study, and snowball sampling was responsible for the remaining 5.

Participants have been anonymised via the assignment of pseudonyms (P1-P7). P1 was a 28 year non-religious female who had been bereaved of her grandmother less than a year ago. P2 was a 57 year old non-religious female who had been bereaved of her mother less than a year ago. P3 was a 56 year old non-religious male who had been bereaved of his spouse 5 - 10 years ago. P4 was a 69 year old male who described

himself as a spiritual evolutionist, who had been bereaved of his spouse 5 - 10 years ago. P5 was a 25 year old non-religious male who had been bereaved of his grandmother 1-2 years ago. P6 was a 28 year old non-religious male who had been bereaved of his great uncle. P7 was a 25 year old non-religious female who had been bereaved of her grandmother 1 – 2 years ago.

All but two of the participants (P5 and P6) indicated, on a scale of 1 - 5 (1 = not close at all, 5 = very close), that they were very close to the deceased. P5 scored their closeness to the deceased as a 3, and P6 as a 2. The perspective of the data gathered, and the subsequent findings have been influenced by these demographics.

Of the seven participants only one (P3) indicated they had musical experience, and another (P4) that they had written a song before. P3 commented that they play several musical instruments, and had written songs in the past but despite this did not consider themselves an experienced songwriter.

7.2.4 Analysis

The WEMWBS results were analysed using a combination of parametric and non-parametric statistical tests as and when appropriate. The Shapiro-Wilk Test, due to the small sample size, was run to determine whether data was normally distributed and thus suitable for parametric analysis. The interview transcripts were analysed using Thematic Analysis as described by Braun and Clarke [17]. This consisted of the researcher coding data, identifying themes across this coded data, and refining these codes and themes. NVivo 12, qualitative analysis software, was used to do this.

7.3 Quantitative (WEMWBS) Results

A Wilcoxon signed-rank test showed that using ALYSIA in a bereavement context did not elicit a statistically significant change in wellbeing ($Z = -1.020$, $p = 0.308$). Whilst the statistical results were not significant, the wellbeing scores of participants were lower before using ALYSIA ($M = 51$) than they were after using ALYSIA ($M = 53$).

An independent t-test showed that younger participants had a statistically significantly higher change in their wellbeing score (5 ± 3) than older participants (-2 ± 1), $t(5)=3.709$,$p= 0.014$.

7.4 Qualitative (Interview) Results

Six key themes were identified in the interview data related to the participant's experience of using ALYSIA in a bereavement context: (1) Support Expression; (2) Support Engagement with bereavement and grief; (3) Reframe the engagement; (4) Receptiveness to ALYSIA; (5) Other applications for ALYSIA; and, (6) Suggestions on how to improve ALYSIA.

7.4.1 Support Expression

Participants expressed concern in their own ability to create a song, and to create a song that adequately reflected and respected the deceased. Most participants began the study doubtful of their ability to write a song. P1 remarked *"I think starting is going to be the hardest part"*, and P2 commented *"It is quite hard, I'm not very musical."* P1 went on to say, *"Writing a song is quite hard, especially if you have never done it before. It isn't something you think yourself good at. I've never been much of a writer, and songs are largely lyrics."* Participants also had preconceived notions of what they thought a song should be. P1 and P7, for example, felt a song should have rhyming lyrics and as such initially strove to ensure their lyrics rhymed, and P5 felt the song to be created should not be too happy or morbid, it should be poignant and commented achieving that was *"quite difficult"*. Additionally, participants frequently voiced concerns that the song they created doing justice to the deceased. P1 felt the creation process was *"daunting because I did not know how to start it, and what to write, because I wanted to do it justice."* P2 commented that they wanted the song to sound *"nice because you want it to reflect the person, so you don't want to do a bad job."* P7 expressed a similar desire to create a song reflective of the deceased, *"It is hard because she was so charismatic, funny, and charming, and it is like trying to find a song or lyrics that actually show that."*

Despite the above doubts and issues, all of the participants successfully created a song felt ALYSIA helped them express themselves by writing or selecting lyrics. Many of the participants ended up writing their own lyrics, despite a belief they would use lyrics suggested by ALYSIA. P1 commented that they went into the study believing they would use ALYSIA generated lines but ended up writing 3 out of 4 lines by themselves. P1 felt that being able to *"shuffle through a lot of* [lyric] *suggestions was really helpful…and it wasn't showing the same ones again which was nice."* P1 went

on to remark that using the system *"was good"* but *"hard because there were so many decisions that I could make. It was hard to start the song, it ended up I wrote 3 of the lines in it* [the song] *myself and only used one generated line."* P2 had a similar experience, *"I was surprised. I thought I would have picked generated lines but I didn't actually like any of the generated lines, so that kind of forced me into trying to write something. I think if you get a block then it would be quite good."* P7 also went into the study expecting to use ALYSIA generated lines, but remarked *"Some of the phrases and stuff it suggested were quite good and quite funny. Obviously I ended up using one of the…one line was the autogenerated one, but more often than not it was just my lyrics, but it definitely helped me get there. I don't think I would have got there without them."* Three participants used solely ALYSIA generated lyrics, but felt these helped them express things they hadn't realised they felt. P3 commented *"I thought the lyric writing part gave you a lot more flexibility…instead of asking what you thought it gave you lots of things and you could pick out ones you maybe didn't realise you thought. That was very clever,"* and went on to remark *"The lyrics part I thought was interesting because I thought it was going to be really hard to think up lyrics but then there were lots of them there and so that made it really straightforward."* P5 remarked that it was quite *"difficult to actually think of the lyrics, but then having the suggestions made it a lot easier."* P6 expressed similar praise for the lyric suggestions, *"It was quite good. I think the choices that were there were actually not too bad. They were kind of what I was thinking"* and went on to remark *"They were really useful".*

Participants, largely, felt comfortable using ALYSIA to express themselves regarding their bereavement. Although some participants remarked that the presence of the researcher made them feel a little uncomfortable, as did singing and listening to the recording. P1 remarked that *"It is a little embarrassing to sing",* and the knowledge that they would have to hear listen to themselves sing was daunting. P1 went on to say listening to the song with someone else there *"made it a bit more uncomfortable because it is quite a personal thing, writing a song and then having it played multiple times as you are attempting to sing it in front of other people."* Despite this, P1 *reported they felt comfortable writing about their bereavement experience, because "There wasn't much pressure on me to write it…I didn't feel like you were waiting on me to finish – you didn't mind waiting."* P1 also felt more comfortable expressing themselves with ALYSIA because writing on a tablet gave them access to spellcheck.

P3 also felt comfortable creating the lyrics, remarking it was *"more comfortable than I thought it would be. I thought it would be awkward at the start."* P5 felt it was comfortable *"to an extent"* and that grief and bereavement will always have a level of uncomfortableness to it. P7, when asked whether they felt comfortable writing about their bereavement experience replied *"Yes, and no."* P7 felt comfortable expressing themselves, but was worried what other people would think if they got access to the song. P7 went on to say, *"I guess I worry about what other people think but I don't know why I should because it is not their grieving".* P2, on the other hand, reported that they felt *"more uncomfortable"* because of the formal setting. P2 felt *"a bit put on the spot"* but commented *"if I was doing it privately, if you had this as a thing you just did as yourself and you didn't have to share then that would probably be better, more therapeutic. I think because, I guess, in an interview you have a certain judged element to it because someone else is hearing it too, not just you."*

Participants felt ALYSIA gave them control over how they expressed themselves, and what would be created as a result of this expression. P1 felt ALYISA gave them *"A lot of control actually, I was surprised. You can choose your melodies and things like that, the background music, and you can choose different genres…I chose a country song which I don't think I would have thought that I'd have chosen going into it. It gives you a large variety and you can change that depending on your mood, and you can go back and change things if you change your mind. Good and bad if you are indecisive. I like the fact that it gave you the option to sing along, and you got to choose the melodies that go with it."* P4 expressed similar feelings, the ability to select genre, and moods gave them feelings of control, as did the lyrics *"because they were my rods. The system had nothing to do with the words I chose."* P5 described ALYSIA as giving them *"total freedom to do what you want"*, and P6 felt ALYSIA gave them *"enough input".* P2, however, had mixed feelings over the control they had over what was created as a result of the synthetic sound of the finished song. P3 had similar feelings, they felt a lack of control over the music side as the melodies all sounded very similar to them, but felt control during lyric generation. P7 also had mixed feelings over the control they felt as they could not dictate how the lyrics were to be sung. Additionally, the participants liked that they had control over whether the song would be shared with anyone else. Many of the participants felt that they would like to share the songs created with people in their immediate family, whilst P7 remarked

they would have been more comfortable using the system if they knew no one would be able to access or stumble across their song.

Overall, participants felt the system helped them express themselves. P2 spoke positively about the system as a whole, *"This helps towards making people creative because it is like you have got someone else there you are bouncing ideas off."* P2 went on to theorise that in a bereavement context, a creative aid such as this would let you bounce ideas off the system in private *"which you probably want to do if you are in a grief situation"* rather than doing so with other people. P3, despite feeling a little constrained by the system, said *"I thought it* [creating a song] *was going to be hard but it wasn't. It was really fine. I think it is because I found things* [lyrics] *that worked for me."*

7.4.2 Support Engagement with Grief and Bereavement

Participants reported that creating a song with ALYSIA supported them to engage with their grief and bereavement experience. Participants remarked that creating the song with Alysia had helped them: (1) Interact with their feelings; (2) Reminisce; (3) Create personalised songs; (4) Continue bonds; (5) Accept the reality of their loss; and (6) Facilitated communication with other people.

All of the participants felt using ALYSIA helped them interact with their feelings related to the bereavement. Participants spoke positively about how creating, and listening to the songs helped them engage with their feelings, and in some cases made them aware of how they felt about the bereavement. P1 remarked:

> *"You are always going to miss someone when they are gone, really, but I think writing about it and especially just being able to hear it played back and then being able to sing along really helped me come to terms with what I had written and how that could be interpreted – how sad it could be and things like that…I guess I was sadder about it than I realise, but not in a bad way."*

P1 went on to comment that playing the song back *"helps you realise what you have written and how you are feeling about it, because you are actually hearing it"* and that *"sometimes hearing the lyrics back made me feel a bit emotional and sad…it has made me feel kind of better about it. It made me realise how much I miss her but I think it is*

quite good to remember people that you have lost and to think back on the fond memories, so they are not forgotten." P2, like P1, experienced sadness creating the song, *"I guess it made me feel a bit sad because I was focussed on something I didn't really want to focus on, I guess",* but *"I didn't feel as sad listening to the song."* P2 theorised this was because they were *"trying to put* [their] *feelings into words"* which they found difficult to do. P2 felt they had not had time to engage with their bereavement and that they *"had to squash it down at the time, because it is not about you, it is about making sure other people are okay. Whereas this is you focussing on you when you are trying to write what did it mean to you which is harder."* P2 went on to say that expressing themselves in the formal context of a study, and with the researcher present that interacting with their feelings was not as helpful as it may have been had the done so in private. P4 felt choosing the mood themes *"touched the emotional part of me. I picked words that meant something to me"* and that creating the song let them *"get that emotion out of myself and into something else".* P4 went on to comment that hearing themselves sing the song, and discussing it with the researcher had helped reinforce their feelings and that they were glad they took part. P5 also felt ALYSIA afforded bereaved people the opportunity to *"put all their emotions, and all their thoughts at that time down into a song. No matter how depressing or horrible and sad it is"* and that when they were *"feeling a bit better, not over it, but that they had dealt with it, they can listen to it and realise that they have actually dealt with it quite well, and it is not as bad as it was back then."* Participants also reported the lyrics generated by ALSIA from which they could select lines heled them interact with their feelings. P3 felt the lyric suggestions were *"helpful", "very reflective"*, and *"made me think about things I didn't realise I was thinking about because it* [ALYSIA] *made suggestions."*

Participants also felt ALYSIA helped them reminisce about the person they lost. P1 spoke of how one line suggested by ALSIA reminded them of the person they had lost as it spoke of the sea, and the participant spent a lot of time with the deceased on the coast. P1 remarked *"It allowed me to kind of remember all of my past, favourite memories and things like that to try and inspire me to write the song and to come up with lyrics…"* P1 went on to say ALYSIA provided them with an opportunity *"to think about my grandma and going back on the memories and things you kind of forget about when you're just living day to day. It was nice. I liked it. There are little parts*

in the song that bring up other memories." P1 spoke positively of about the ALYSIA inspired reminiscence, *"I enjoyed it. I left feeling better about it, and about my relationship with my grandma because I was remembering all the good past moments," and that "It made me feel happy."* P2 felt it was a somewhat strange experience creating the song as it is not something they are accustomed to, but felt that using ALYSIA *"made me focus a bit more on the good memories and what I enjoyed…it helped me think back on things you would want to be in a song. You want to remember the happy times, or at least I do. I'm sure everyone is different, but it is quite nice to have that preserved in your own way."* P5 remarked that ALYSIA allowed them to *"reminisce without getting upset"* and made them *"think about the person more deeply"* than they would in everyday life. P6 also spoke positively of ALSYIA's ability to facilitate reminiscence, *"*[using ALYSIA] *makes you reminisce about the person which is quite good"* and *"it is just nice to actually think back to what they were like, so that is quite good"*. P7 made similar comments, *"I definitely feel better after it* [creating a song with ALYSIA] *…it is sort of nice to sit down and properly think about her and the good times rather than just missing her and stuff like that. It is nice to reflect on that positive stuff"*, and remarked that the song *"made me laugh, so it made me feel happy and reminded me of her. I feel like she would have been happy or pleased with it".*

Participants spoke about the personal nature of expressing themselves and creating a song related to someone they have lost. P1 spoke positively about ALYSIA allowing the user to sing the song themselves, stating *"It was nice to be a part of the song in that way as well* [singing it]*, so I kept the woman* [ALYSIA] *singing alongside me because she helped me keep my tune but it was nice to be part of it".* P1 went on to say it was *"quite personal* [writing and singing the song] *but I guess most song writing is…it is very personal for me because it is written for her. She would probably really like it, the idea of it, someone is writing a song about her."* Although P1 remarked on a friction between creating a personal song and one that could be consumed by other people they did not necessarily know. P1 wanted to include personal details in the song but did not because they *"wanted to keep those things"* for themselves, and wanted to keep the song *"a bit more vague".* P1 sought to keep the song vague to ensure personal details were not shared outside the immediate family of the deceased. P3 and P5 also felt singing the song would have made it a more personal experience,

and song. P3 felt if they had sung their song it wold have been *"a lot more personal"* which they felt *"would have been good."* P7 felt the song was personal and was worried about the possibility of someone else stumbling upon the song, listening to it, and judging it. Some participants were met with difficulties that challenged the personal nature of the song, and creation. P2 and P7 had very specific music genres and artists in mind and could not find anything suitably similar, and as such felt their songs were less personal. P4 felt using ALYSIA by itself depersonalised the experience, but that using ALYSIA with another human present and discussing the process and song created a personal and helpful experience. Additionally, P4 found a genre of music that is personal to them, and the suggested moods spoke to their experience, and as such contributed to the personal feelings of the song and creation.

Many of the participants made comments that suggested using ALYSIA had helped them continue bonds with those they lost. P1 felt the system had helped them remember the deceased, and remarked *"I think it is quite good to remember people that you have lost and to think back on the fond memories of them so they are not forgotten."* P4 more explicitly spoke of continued bonds with the deceased. P4 commented creating and listening to a song with ALYSIA *"reinforced the fact that she is still inside me. It made me feel closer to her, if you like. Made me feel close to her because the words were coming out, and the song made me feel close. I felt close to her, which I often do."* P4 went on to remark that singing the song and writing the lyrics made them feel closer to the deceased, but singing them more so because they felt as if they were singing to the deceased. P4 felt using ALYSIA had created a *"closeness, where you feel you are still connected with the person which is always helpful"* and that the closeness they felt as a result of taking part in the study was much stronger than it ever had been. P5 also believed using ALYSIA gave them *"a connection to the person because you're not trying to copy what they listen to, but obviously you want it to be reminiscent of what they were in to"* and that it made them think about the person more deeply than they would in everyday life.

Some of the participants felt using ALYSIA helped them accept the reality of their loss. P1 commented that it would not have crossed their mind to write a song about their bereavement experience or the deceased but that it *"helped because I find it good to think back and remember the good times and to try and kind of express the feelings of loss about them no longer being here because that is hard to come to terms with*

that you're not going to create new memories with them again. If you have kids and stuff they aren't going to meet them, this is kind of hard." P1 went on to say *"I think it has just made me realise how much I miss her as well",* and that taking part in the study helped them *"come to terms"* with the loss *"a bit more and made me realise maybe how sad I am about it still."* P4 remarked that using ALYSIA had made them feel *"a deep sense of loss, but it made me aware of what I had lost. What I had lost, yet not lost. I've only lost her physically."*

One participant, P4, spoke at length about how they felt using ALYSIA with the researcher present and subsequently being interviewed added to ALYSIA's therapeutic value. P4 reported that they found ALYSIA helpful but that there was no *"comfort"* in the system. They felt there needed to be a human present, to hear them, and to provide support. P4, additionally, felt the presence of another human would ensure they used ALYSIA properly. They went on to comment *"digital things can be helpful, they can be tools that the human being can use to aid the process, but I don't think one survives without the other."* P4 believed that ALYSIA was one element of a *"full package"* and that to achieve maximum effect should be used with another human, and the process and song should be discussed afterwards. They described ALYSIA as pain medication, and said whilst it is helpful, it does not solve what is causing the pain.

7.4.3 Reframe engagement with grief and bereavement

Most of the participants felt that ALYSIA had re-framed their engagement with feelings and memories associated with loss. P1 remarked *"It was nice to be able to think about her in a way that was different, because I was trying to create something from my memories of her so it was quite nice being able to do that"* and that ALYSIA had helped them *"focus more on the positive memories of her* [the deceased]*"* rather than the negatives *"which I think is a nice thing to do, especially when the person is gone."* P1 went on to say it was *"fun trying to use the system and to hear my voice back and things like that. It kind of made you forget about the feelings of sadness associated with loss."* P1 felt *"quite happy"* when writing the song, but when they listened to it, they *"got quite sad because I realised what I had written, but it was fun."* P2, likewise, was distracted from feelings of loss when they reached the lyrics section of the system and commented *"the creative element takes over and you are focussed on a creative task…you are removing yourself from that loss, I guess that is*

helping you move forward if you are stuck in negative feelings" and remarked selecting happier moods or themes could help direct people down a *"more positive path".* P4 felt using ALYSIA *"didn't make me focus on the loss in a negative way. It wasn't a negative feeling of loss. It was a comforting feeling, some strange way it was comforting. It was a warmth I felt when I felt the loss."* P5 also felt ALYSIA focussed them on completing a creative task, rather than an emotional one, *"I wouldn't say it distracts you. I would say it takes you to a different way of thinking about it. You're not thinking about it as 'Oh, she is dead', you're thinking about it as if 'I'm writing a song about this person who has passed away. What do I want the song to sound like, what would they want it to sound like?'"* P6 stated using ALYSIA *"framed"* their engagement with the bereavement and their feelings *"differently"* and that when they were using ALYSIA it didn't make them think about the loss but on what the deceased was like.

7.4.4 Receptiveness to ALYSIA

The participants spoke favourably about ALYSIA and reported that it had helped them in some way, and that they wanted to create another song. The reasons for this are summarised in the above sections, and are mostly summarised by P1 who commented *"I think it did help…I think this does help process what has happened because it makes you think about it a bit more or think about your time with the person or what you are feeling and I think writing them down and expressing them kind of helps you come to terms with it."* Most of the participants had fun using ALYSIA, and there was laughter throughout the process despite the context of the study. All of the participants believed a system such as ALYSIA could prove beneficial to bereaved users. Many of the participants stated they would use the system again, and in a bereavement context, but only a few wanted a copy of the song they created. Three participants listened to their song enough times that they remarked it would be stuck in their head. Another three participants who were bereaved of the same person, and were interviewed on the same day at their home, collectively asked if it would be okay if I played each of their songs.

7.4.5 Other applications for ALYSIA

Participants saw additional applications for systems such as ALYSIA. Many of the participants commented that they believed ALYSIA may have been more helpful when used by someone who has experienced a recent or sudden loss. P1 commented

"I think especially if it was maybe a sudden loss, maybe if I felt like I wasn't coping with it as well, I think this does help process what has happened because it makes you think about it a bit more or think about your time with the person or what you are feeling and I think writing them down and expressing them kind of helps you come to terms with it". P3 similarly theorised using ALYSIA may have been more helpful to them if it was nearer the time the deceased died. Some of the participants also saw the potential for such a system or song to be interacted with over time, which P1 and P2 felt this could lead to the creation of different songs depending on how the user felt on a given day, and P1 felt the interpretation of the song could change based on how the person is feeling on the day they listen to it. P4 felt using ALSYIA had not only made them think about their own feelings and reaction to bereavement, but also made them think about how other people cope with grief and bereavement.

P2 felt a system such as ALSYIA could be helpful for parents who have lost a child. P2 theorised it would let the adults *"take time out"* to engage with their own grief by themselves, ALYSIA was *"something they could do on their own"* whilst they normalised bereavement for their other children and support them. P2 also felt systems such as ALYSIA could be beneficial for children who have experienced bereavement. P2 commented it *"would be a great thing for kids to actually channel things for them. I think it would be really instructive for them."* P2 felt systems such as ALSYIA could not only help children explore how they feel, but ensure the parents understood. P2 felt ALYSIA could be beneficial for children in a bereavement context *"because it would allow them to explore things maybe that they couldn't tell you…because I think if you are talking to kids you tend to direct them as to how you think they are feeling which might not be how they are feeling at all and then you could end up making things worse for them because you are leading them down a negative path because that is what you are worried about. Whereas, if you let them play with that you can actually see the things they are saying and then maybe challenge or channel them in a bit more positive light or get them to think on more positive things."* P2 also spoke of ALYSIA being beneficial in more general terms to creativity at large. P2 spoke about how hard it can be to *"become creative"* and that ALYSIA was *"something that helps you become creative"* which is good. P2 described ALSYIA as *"something that helps you become creative", "an aid, like if you have a lot of creative people together you are bouncing things off, you can do it by yourself* [with ALSYIA] *which you probably*

want to do if you are in a grief situation but you've still got those ideas being bounced off." P2 remarked *"You used to think people are either creative or you're not creative but actually this* [ALYSIA] *helps towards making people creative because it is like you have got someone else there you are bouncing ideas off."*

7.4.6 Suggestions for the improvement of ALYSIA

Participants noted areas they felt could be improved upon to create a more beneficial to the bereaved system. All of the participants felt the synthetic or robotic sound of the songs detracted from the aesthetic quality of the song. Participants noted the robotic voice as the main contributor to this, and felt if the voice sounded more human the songs would have been better and for P5, more genuine or real. P1 also commented that the tone of the singer's voice could alter the emotional value of the song. Some of the participants also mentioned that the music itself was somewhat electronic, which they did not like. P3 made comments that suggested they felt the system could be improved by allowing users to contribute musically to the song as well as lyrically by inputting music they have played. P7 also wanted an increased control over the song, and wanted to be able to dictate how the lines were sung and how they were split between musical notes. P6 experienced difficulties when they tried to alter the sound and effects of the song, they found the dials hard to turn. P1 and P7 spent the longest amount of time creating their songs, and frequently wanted to change genre after writing lyrics. They both expressed an annoyance at having to restart the song in order to change genre. Additionally, they felt it would have been beneficial if there was the option to save lyrics they liked but were not sure about using. They felt being able to save suggested or written lyrics for later use would have been good. P2, P6, and P7 similarly felt the system would have been improved if they had been able to rearrange the order of the lyrics without having to retype them all. Three of the participants (P1, 2, and 7) experienced slight difficulties writing the lyrics and felt this could be overcome by the system instructing users on rhyming schemes, meter, or how to write a poem, stanza, or lyric. Some of the participants were unhappy with the range of genres available, P3 was surprised there was no blues considering they had been asked to write about their bereavement experience, whilst P2 and P7 wanted music similar to specific artists that the deceased had liked and struggled to find a song reflective of this. P2 also commented that they felt the song titles did not match the sound of the song which made it difficult for them to find a sound they liked. P1 commented on the

images that accompany the song titles, and expressed that the system should allow users to create or select an image for their song. They felt this would help personal the songs and create a connection. P4 felt that while ALYSIA was helpful, that it should be used in conjunction with another human. They felt this would amplify how effectively the system helps bereaved people.

7.5 Summary of Results

The results of the WEMWBS indicate younger generations more immersed in digital technology are more likely to benefit from CC support systems than older generations. Additionally, the wellbeing score of all participants changed after using ALYSIA: for the younger generations the wellbeing scores improved; and for the older generations the scores worsened.

All of the participants reported that they felt using ALYSIA prompted them to explore thoughts and feelings related to their bereavement experience, and in some cases made them aware of feelings they were previously unaware of. Participants spoke positively about the parts of the system they had the most freedom over, chiefly the lyrics composition. Participants felt ALYSIA's suggested lyrics inspired them to write their own lyrics, made them aware of feelings they were previously unaware of, or captured how they felt completely. Participants reported that by being asked to explore their bereavement experience in the pursuit of a creative task the negative feelings often associated with bereavement were lessened or replaced with feelings of validation or achievement upon completing the song, and that creating the song distracted them. The majority of the participants reported that they felt comfortable using the system to express themselves, but that if they had been able to use ALYSIA in private (without the researcher present) they would have felt more comfortable. Many of the participants remarked that using the system made them feel closer to the deceased, or that it facilitated the continuation of bonds between them and the deceased. Participants similarly reported using ALYSIA facilitated several other actions often associated with adaptation to bereavement and successful coping with bereavement (e.g. reminiscence and reflection). The few (two) participants who opted to sing felt this added another dimension to the system and that it made the song not only more personal, but brought them closer to the deceased, and validated what they had expressed upon hearing it back. Participants, however, responded less favourably to

the areas of ALYSIA where they had less control. Participants felt constrained by the music selection and generation, participants couldn't find the style of music they wanted, and were unable to edit the notes to reflect what they wanted.

7.6 Discussion

The results of the WEMWBS show that every participant underwent a change in their wellbeing score after using ALYSIA. This suggests that using ALYSIA to create a song about their bereavement experience did have an impact on the participants' wellbeing, but this impact was not statistically significant. This could be a result of the limited number of participants. Despite this, 3 of the participants experienced what the WEMWBS guide describes as *"meaningful positive change"* whilst only 1 participant experienced *"meaningful negative change".* These positive and negative changes in wellbeing score were influenced by age in a statistically significant way, with younger people experiencing an increase in their wellbeing score and older participants experiencing a small decrease. This suggests systems such as ALYSIA could be most beneficial for people under the age of 30, who have grown up using digital technology in their everyday life. Additionally, this could suggest that as more generations grow up using digital technology that systems such as ALYSIA may become increasingly useful and relevant. Additionally, the two of the three older participants felt constrained by the system which would have negatively impacted their wellbeing score as the WEMWBS includes questions related to feelings of usefulness and control.

The interviews shed light on the experiences of participants using ALYSIA and what may have contributed to the change in wellbeing scores. Participants, who mostly, expressed uncertainty about their ability to create a song reported ALSYIA helped them express themselves and create a song. ALYSIA reportedly helped participants express themselves by inspiring participants to write their own lyrics, or by presenting participants with suggested lyrics participants felt captured how they felt or memories they had. This shows that systems like ALYSIA have the potential to facilitate self-expression related to difficult topics and enable people unsure of their creative capabilities to complete creative tasks. This suggests, as some of the participants did, systems such as ALYSIA could prove beneficial in supporting children and other people who may have difficulties comprehending and expressing feelings they have

associated with bereavement. CC systems such as ALYSIA, in this regard, could operate in a similar way to arts therapies which have been shown to benefit children, who may otherwise find it particularly challenging to comprehend and express feelings associated with the loss of a loved one [154]. Arts therapies have been shown to help children express themselves and cope with grief [108], and as such, expanding the children's creative capabilities through co-creative systems may prove beneficial.

ALYSIA helped participants undertake or achieve tasks formal interventions for bereavement often seek to facilitate. Participants reported using ALYSIA not only helped with self-expression, but helped them identify feelings they were not previously aware of, that it helped them accept the reality of their loss, reminisce, and continue bonds with the deceased – all of which have been found to be beneficial for bereaved people in adapting to and overcoming their bereavement and grief.

Participants reported ALYSIA reframed engagement with their bereavement and grief. Participants, mostly, were not focussed on the loss of the person or negative feelings associated with the loss, they became engrossed in a creative task or were caught up remembering happy memories. This highlights the possibilities for co-creative systems to facilitate user engagement with bereavement and grief. These systems can help users engage with their bereavement and grief in a re-framed way that focusses on a creative task or can provide feelings of validation or satisfaction as a result of a reflective possession being created. This re-framed engagement could also somewhat shield users from any anxieties related to what they have expressed or how they have expressed it, they have done so with help from the system and any faults or flaws perceived by others can be blamed on the system. This could facilitate more regular self-expression amongst bereaved people which could help them come to terms with their loss, and potentially help those who have experienced more recent or sudden bereavement engage with their feelings in a timelier manner.

Other than aesthetic issues with how the created song sounded *("robotic"),* participants had only two concerns with ALYSIA. One participant (P3) felt the system should give users increased input into the background music. This suggests the system could be improved by involving the user more, and allowing them to input their own music into the system during the creation process. The most pressing concern, however, with ALYSIA in the context of this study was the presence of an

"audience". The majority of participants reported they would have felt more comfortable using the system by themselves. This suggests private use could be more therapeutically beneficial to the bereaved as they have the freedom to create or write whatever they want without fear of being judged. Despite this, one participant felt that whilst the system was helpful the presence of the researcher and subsequent interview augmented its therapeutic benefits. This could suggest that for some, especially older people and people bereaved of the same person, the ability to use the system with other human co-creators could prove beneficial.

7.7 Conclusion

This chapter provides answers to the fourth research question: In what ways do users find CC systems helpful in engaging with their bereavement experience? By exploring the user experience of using CC systems in a bereavement context.

We found that ALYSIA, a system that met many of the design objectives presented in the previous chapter, achieved the first design goal (support self-expression) for all participants, and that it was more likely to achieve the second design goal (promote mental wellbeing) for younger users. ALYSIA helped participants express themselves, engage with their bereavement and grief, and reframed engagement in a way that lessened negative emotions often experienced as a result of engaging with bereavement. ALYSIA showed itself able to offer bereaved people a safe space in which they could comfortably express themselves to create a song, with a non-judgemental collaborator that can facilitate user creativity. Participants reported ALYSIA had helped them to interact with their feelings, be it through expressing them or ALYSIA making the participant aware of how they felt. Participants were receptive to the system and remarked ALYSIA had made them aware of feelings they had not been aware of, and made them feel close to the deceased. Participants sought to create personal songs that were vague enough to protect the privacy of the deceased, and in some cases expressed eagerness to share these with family. We believe that the potential of therapeutic CC is not limited to bereavement, and could prove beneficial for other issues that may impact mental wellbeing (such as anxiety, and depression). Likewise, we posit the therapeutic value of CC systems are not limited to songwriting and song creation, and may span other creative pursuits (such as painting, and poetry).

CC systems offer an informal avenue of community support that is accessible, affordable, and private. Through interaction with creative machines, users with diverse creative abilities will be able to better connect to themselves and reap the therapeutic benefits of engaging with their feelings. This promising novel direction widens the scope, application and value of CC, suggesting new reasons and new stakeholders as part of the answer to the question of why, and for whom, do we develop computationally creative systems?

In the next chapter a summary of this and the proceeding studies will be presented, and the contributions of those studies and this thesis discussed. Additionally, challenges and limitations of these works will be discussed, and future directions for work in this area will be identified and discussed.

Chapter 8

8 Discussion

8.1 Introduction

The aim of this thesis and the research reported herein was to explore the design of CC systems to support bereaved people experiencing normal or uncomplicated grief. In the pursuit of this aim a series of ten design opportunities were identified (Chapter 4), evaluated (Chapter 5, 6, and 7), and refined (Chapter 7) into a series of nine design objectives that fulfil two design goals that intend to support bereaved people.

This chapter first synopsises the four studies conducted as part of the research presented in this thesis, including the research questions they sought to answer and the findings. Second, it presents and discusses the contributions of this thesis, organised into themes, and how they relate to and build from related works. Third, it presents challenges and limitations of the research conducted and future areas to be explored. Fourth, the key findings of the thesis are restated.

8.2 Summary of Thesis Studies

A series of research gaps were identified through the literature review. The most important was that technology to support the bereaved focusses on reminiscence and archiving rather than self-expression. Some studies have explored the creation of personalised memorial possessions [106,167] but few touch on self-expression [106], and these do not make use of advanced technologies such as CC. CC researchers, likewise, have mostly focussed on creativity in general, and on the creation of CC systems, rather than exploring their potentially therapeutic nature. The following two-part question was used to guide the studies reported herein to address the research gap:

"Can CC systems help users undertake actions associated with successful adaption to bereavement and grief? If so, how do we design systems to achieve this?"

To answer the above questions four interrelated studies, each with their own research question, were conducted with each subsequent study building from the last.

8.2.1 Study 1

Study 1 addressed RQ1: *How can CC systems be designed to facilitate current reminiscence practices of the bereaved?*

The results of Study 1 suggested that in order to facilitate current reminiscence practices, and to meet potential user preferences, CC systems should:

- **Be available freely online**, to support increased interaction with participants in the aftermath of loss, and to support sharing of stories related to the deceased between friends and family.
- **Output physical and digital possessions**, to support the creation of possessions that the bereaved are likely to interact with and value.
- **Present framing information alongside the co-created possession**, to help users understand newly co-created possessions and attribute them provincial information that often increased value.
- **Incorporate digital degradation into digital possessions**, to imbue similar value to digital possessions as afforded to physical possessions, and to increase the meaningfulness of interactions with digital possessions.
- **Allow for and foster repeated use**, to support continued engagement with the bereavement experience in a positive way, through the co-creation of new possessions that can support reminiscence and reflection.
- **Allow for varied input**, to allow bereaved users to use what possessions they have access to related to the bereaved, to co-create new possessions. Additionally, to allow users to express themselves in whichever way they feel most able (e.g. through creative or non-creative writing).

- **Require user participation**, to facilitate self-expression and reminiscence, and to ensure that reflective possessions are created, rather than possessions that mimic the deceased.
- **Employ sentiment analysis**, to support the co-creation of emotionally reflective possessions.
- **Ensure input and output is available only to those who created it**, to ensure the privacy of users and to keep the confidentiality of what they express into the system.

8.2.2 Study 2

Study 2 addressed RQ2*: How can CC systems facilitate the creation of more meaningful digital possessions – digital media such as text files, or music?* It tested three of the design opportunities identified in Study 1 (Chapter 4):

1. Require user participation
2. Employ sentiment analysis
3. Present framing information

The results suggest that each of the three opportunities tested can increase feelings of ownership over digitally co-created possessions and contribute to the creation of a connection between person and possession. Recent participation in the creation of input for the CC system significantly increased users' perceived ownership, as did the creation of emotionally reflective possessions, and information that explained the system, the co-creation process, and the user's role.

8.2.3 Study 3

Study 3 addressed RQ3: *How can CC systems be designed to reflect the approach taken in formal interventions to support the bereaved?*

Study 3 explored the support provided to bereaved people by mental healthcare practitioners, and had these practitioners evaluate the design opportunities identified in Study 1. The results of Study 3 led to one design opportunity being discarded (digital degradation) and the rest being refined into nine design objectives for CC systems that work towards achieving two design goals:

- Promote Self-Expression
    - Make support available: users would benefit from support available online that is affordable
    - Give users control: over what input to use, the materiality of the possession created, and whether it is shared with others
    - Explain the process: users would benefit from information that explains the system and their role in the co-creation process
    - Support individual and collaborative use: some people may benefit more from private or collaborative use
    - Protect the privacy and confidentiality of users: the input and output should be available only to the user unless otherwise requested
- Promote Wellbeing
    - Normalise bereavement and grief: providing educative information about bereavement and grief can validate and help users process their feelings
    - Provide an interactive experience: users may benefit from different levels of interaction with the system
    - Create reflective possessions: emotionally reflective output could facilitate the exploration, processing and validation of feelings expressed
    - Create a meaningful, lasting memento

8.2.4 Study 4

Study 4 addressed RQ4*: In what ways do users find CC systems helpful in engaging with their bereavement experience?* Study 4 had bereaved people use a CC system that seized many of the opportunities identified in Study 1 and refined in Study 3. The results of this study validated the nine design considerations and suggest that CC systems can promote self-expression related to bereavement and promote positive mental wellbeing. Participants found the system helped them carry out actions associated with successful adaption to bereavement and processing of grief, and re-framed the actions to lessen the negative emotions often associated with carrying out these actions. Additionally, there was found to be a significant difference in how the

use of CC systems impacted the mental wellbeing of bereaved users based on age, with younger users benefiting and older users experiencing a decreased mental wellbeing score.

8.3 Design Goals and Objectives

This thesis has shown that bereaved people and mental healthcare practitioners are receptive to the use of CC systems to support the bereaved. Additionally, Study 4 indicates CC systems have a measurable impact on a user's mental wellbeing, and support actions associated with successful adaption to bereavement and the processing of grief. We have identified two design goals for CC systems intended to support the bereaved, and a series of objectives through which these goals can be achieved (Table 8) and bereaved people supported. These goals and objectives are discussed in the following sections.

Design Goal	**Design Objective**
Support Self-Expression	Make support available
	Give users control
	Explain the process
	Support individual and collaborative use
	Protect the privacy and confidentiality of users
Promote Wellbeing	Normalise bereavement and grief
	Provide an interactive experience
	Create reflective possessions
	Create meaningful, lasting possession(s)

Table 8: Design Goals and Objectives

8.3.1 Support self-expression

Self-expression is amongst the most effective ways of adapting to bereavement and processing grief (Chapter 2 and 6). CC systems that meet the following five design objectives facilitate self-expression amongst the bereaved, and are in line with support provided in formal settings in which the facilitator seeks to encourage self-expression by empowering the client, discussing the help to be offered, and by providing them with a safe space to express themselves in with someone they do not fear judgement from (Chapter 2 and 6).

8.3.1.1 *Make support available*

Bereavement can be a difficult experience to adapt to and process. People often need help to process and express themselves the aftermath of loss, but formal support is not always necessary or available (Chapter 2 and 6). A large-scale survey conducted in Scotland found that 23% of respondents, despite wanting support, did not access support as a result of not knowing how to access it, feeling uncomfortable seeking it, or because they couldn't find the type of support they wanted. [146]. The same report cites estimates that between 10 – 20 percent of bereaved people will experience prolonged grief, for whom support is important. These numbers highlight the importance of making support as widely and easily accessible as possible.

CC support systems can tackle the issue of availability by making support easily and widely accessible from the comfort of one's home or device on the go. This can be done by making the CC system available online or for download to be accessed offline, with minimum cost (if any) for users (Chapter 2 and 6). This level of availability and affordability opens support to those who cannot or will not seek formal interventions, and provides an informal avenue of support for those who do not require formal interventions – which could free up access to formal interventions for those who do need them. Additionally, it allows users to access support as and when needed, and to do so from a safe place (i.e. at home) through the privacy of their personal devices (e.g. smartphone). This is supported by findings from previous work that identified community support or non-formal interventions as valid and important avenues of bereavement support [92], and that online forums and groups encourage the bereaved to self-express (Chapter 2).

8.3.1.2 *Give users control*

Bereaved people are more likely to engage with support that aligns with the type of support they desire [146], and that they have control over (Chapter 2 and 6). Those who provide support to bereaved people often spend initial sessions explaining the support offered, and what will be expected of client and facilitator (Chapter 2 and 6).

Three ways to give users control over CC support systems were identified that would encourage engagement with the system, self-expression, and the creation of more valued co-created possessions. These are control over:

- what input is used

- what materiality the output creation is
- whether it is shared with others

These areas of control are similar to the user-centred approach taken in formal interventions (Chapters 2 and 6), they allow bereaved users to express themselves in the way they feel most comfortable to create an artistic work of their preference that they can opt to share with others if they choose.

8.3.1.3 *Explain the process*

Imparting bereaved users with an understanding of the support they will be accessing serves to facilitate self-expression. For mental healthcare practitioners, this is done by organising introductory sessions with clients to explain the support and set ground rules for practitioner and client (Chapter 6). Similarly, for CC systems this can be done through the provision of simple text that explains what the system is, the co-creation process and the user's role, and the output possession to be created. Users are more likely to engage with support and systems that they understand. Additionally, they are more likely to value possessions co-created with CC systems when they understand how and why that possession was created, and the influence they had over its creation (Chapter 5). Explanatory information accompanying mundane objects (i.e. a glass of water on a shelf) has been used to imbue them with meaning and value to the extent that they have been exhibited as works of art in renowned galleries internationally (i.e. the Tate Gallery).

8.3.1.4 *Support individual and collaborative use*

Bereavement and its resultant grief are unique experiences, as are the ways people process grief and adapt to bereavement. Some people prefer to seek support from others and willingly open up to them, whilst others can be reluctant to or prefer not to. In line with this many organisations focus on one-to-one support for the bereaved (i.e. Cruse Bereavement Scotland) but also run group initiatives to support those who benefit more from a group setting.

CC systems intended to support the bereaved should reflect this and provide the option for private and collaborative use to meet user preference. This will allow those who prefer to grieve alone to do so without fear of judgement or ridicule, and those who prefer to do so as part of a group to do so whilst sharing stories with family and friends.

Individual use of the songwriting system (ALYSIA) in Study 4 was found to be preferential for participants in our studies, although one participant did prefer using the system in the presence of the researcher, which again is reflective of the uniqueness of the bereavement experience and the support provided by mental healthcare practitioners.

8.3.1.5 *Protect the privacy and confidentiality of users*

Bereaved people feel more comfortable and able to open up when they know that what they express won't be shared with anyone else. CC systems designed to support the bereaved should ensure that they protect the privacy of users, and the confidentiality of what is input into the system and what it outputs. Additionally, it is important that the system make it clear to users that their privacy will be protected, and confidentiality maintained. This understanding that their privacy is protected and that their system use remain confidential is viewed by mental healthcare practitioners as one of the cornerstones upon which successful therapy or counselling relies – the creation of a safe space in which anything can be expressed without fear of judgement or what has been expressed being spread (Chapter 6).

8.3.2 Promote wellbeing

Aside from supporting self-expression as a means of processing grief and adapting to bereavement, mental healthcare practitioners routinely seek to normalise bereavement and grief, and support engagement with the bereavement experience and actions associated with positive adaption to it (i.e. emotional reflection, reminiscence, and memorialisation). CC systems intended to support the bereaved should similarly seek to promote the mental wellbeing of users. CC systems can achieve this goal by meeting the following four design objectives.

8.3.2.1 *Normalise bereavement and grief*

The normalisation of bereavement and grief was highlighted by mental healthcare practitioners in Study 3 (Chapter 6) as one of the most important elements of the support they provide. Normalisation was often achieved by simply reassuring clients that it is okay to feel as they do, and that each bereavement experience is unique and individual. CC systems can similarly normalise grief and bereavement in two ways. First, they can provide information on grief and bereavement in general (similar to that conveyed in formal interventions) including simple text-based information and links

to other resources. Second, they can normalise the individual grief and bereavement experience through the creation of a series of emotionally reflective possessions which could be used to chart an individual's bereavement experience. CC systems have the ability to not only educate users on bereavement and grief, but to illustrate users' own bereavement experiences.

8.3.2.2 *Provide an interactive experience*

Successful adaptation to bereavement often requires the bereaved engage with their loss. The bereaved has to accept that the person has died, endure the emotional distress, and adapt to a world without the deceased's physical presence. Mental healthcare practitioners seek to facilitate this by supporting self-expression, and when bereaved clients experience difficulties practitioners explore other options to support expression (i.e. creative arts therapy).

Interactive CC systems encourage self-expression when users feel able, and reminiscence when users feel unable to express themselves. This can be achieved by systems making use of what could be described as a sliding scale of user interaction with the system during the co-creation process: ranging from using pre-existent possessions as input (i.e. letters written by or to the deceased) to using input purposefully created (with or without the assistance of the system) for the co-creation process. This would help users engage and disengage with different aspects of the bereavement experience in line with the Dual Model Process [152]. Systems that encourage users to create input to be used as the inspiration for the system's output support actions associated with successful adaption to bereavement (Chapter 7) and to the creation of possessions users feel ownership over and a connection to (Chapter 5). These actions include expressing themselves emotionally or reminiscing on memories, continuing bonds with the deceased, and by undertaking a creative action that can provide a sense of accomplishment. However, at times self-expression can be difficult, and systems should also support lessened interaction with the system. Participants in Study 4 (Chapter 7) who did not write their own lyrics, but used system-suggested lyrics, reported many of the same benefits as those who wrote their own (e.g. exploration of feelings and reminiscence). This suggests that regardless of whether the input is created by users or made up of user selected suggestions from the system that the act of using the system supports self-exploration and expression.

8.3.2.3 *Create reflective possessions*

Reflecting the emotional content of what bereaved people express can be beneficial for them. It can prompt further exploration of what they expressed and can validate it. Sentiment analysis can be used by CC systems to create output possessions reflective of user input. This can increase feelings of ownership over the co-created possessions, and create a connection to it and the deceased (Chapter 5 and 7), and prompt further exploration of feelings and validation of what has been expressed (Chapter 7). Mental healthcare practitioners in Study 4 remarked that the use of sentiment analysis to facilitate the co-creation of emotionally reflective possessions was similar to actions undertaken by them when providing support to the bereaved (i.e. paraphrasing and repeating what the client has said), which can encourage the exploration of emotions.

8.3.2.4 *Create meaningful, lasting possession(s)*

Bereaved people keep, create, and interact with possessions related to their bereavement experience and the deceased long after the deceased has died. These actions facilitate reminiscence, memorialisation, and the continuation of bonds between bereaved and deceased – actions associated with successful adaption to bereavement and the processing of grief. The possessions bereaved people interact with are often highly valued objects that were once the deceased's or that encapsulate memories of the deceased and are often physical objects. Value was attributed to these possessions in part because of the history they accrue as a result of their longevity and because this history is visible on physical possessions through wear, tear, and personalisation (i.e. handwriting).

CC systems that create meaningful possessions encourage users to interact with the possession after creation. CC systems that employ the previous 8 design objectives are likely to facilitate the co-creation of possessions users attribute value and feel a connection to. However, the co-creation of digital possessions makes it more difficult for these possessions to showcase any history or meaning they accrue through wear, tear, and bequeathal. Digital degradation has been explored in other contexts (i.e. dementia) using physical lockets that contain digital photographs that degrade [170]. Researchers have speculated, in a bereavement context, a locket such as this could give wearers feelings of control over the photograph within, and feelings of comfort and closeness to the deceased [170]. However, they conceded that the degradation of

the digital photograph would take some control away from the wearer (i.e. they can't choose which version of the photograph to look at). They argued this lack of control bereaved people may feel over degrading digital possessions could help them come to terms with their bereavement. This was in stark contrast to the opinions of the mental healthcare practitioners interviewed in Study 4, who believed digital degradation would not be helpful for bereaved people and that this lack of control and degradation would mimic the lack of control bereaved people have over their loss, and the physical degradation of the deceased. Gulotta et al [64] also found that people responded to the concept of digital degradation critically and felt that it negatively affected the authenticity of the digital possession – digital possessions are not supposed to degrade, so why make them? The creation of lasting possessions ensures possessions can be interacted with long after the deceased is dead and gives possessions time to accrue a history and more meaning.

8.4 Challenges and Limitations

8.4.1 Participant Numbers

Due to the rich and sensitive nature of bereavement and grief the studies reported herein were mostly qualitative and explored the experiences of 7 – 13 participants. This allowed studies to focus on gathering rich data, conducive to a deep understanding of participants' experiences, and facilitated the creation of trust and rapport with each participant. The outbreak of COVID-19 and the introduction of social distancing and quarantine measures in the UK limited the number of participants in the final study to seven. To mitigate the limitations of participant numbers, Study 2 did not focus on bereavement, but on the evaluation of three design considerations in general (it did not require participants have experienced bereavement) which allowed for quantitative analysis to be undertaken on data gathered from 35 participants.

8.4.2 Participant Bias

All of the participants who took part in the studies lived in the UK. The majority of participants were of British origin, and *"Western"* culture, and had grown up in the UK as a multicultural country in which the predominant religions are Judaeo-Christian. The participants of studies 1, 2, and 4 had a good mixture of male-female, and of age groups. Study 3 had only female participants, and the participants were

mostly older, however it was not an exploration of how age and gender influence the support provided to bereaved people, nor was it an exploration of how they influence the receptiveness of mental healthcare participants towards CC support systems. Study participants that were bereaved had mostly experienced the loss of someone older. This skewed the possessions that participants had available related to their bereavement experience, as the deceased often did not have much of a digital presence. The few participants who had been bereaved of someone younger, or more digitally engaged, valued digital possessions related to the deceased more. The above demographic information should be considered in the applicability of the findings presented herein, especially if the findings are to be employed in a wider setting (e.g. across cultures or to support complicated bereavement).

8.4.3 Reflections on Participant Pool

As a result of the delicate nature of bereavement the participant pool was determined by the willingness of bereaved people to take part in academic studies in which they would be asked to discuss sensitive and potentially upsetting topics. This made the recruitment of participants a more challenging task than if the topic had been less personal and emotional. The majority of participants were recruited as a result of recruitment posters in areas of Dundee, Edinburgh, and Aberdeen heavily populated by students and snowball sampling. This will have influenced the demographics of those who agreed to take part in the studies. As a result of this, the ages of those recruited are likely to have been lower than if recruitment had taken place elsewhere. This meant that participants in Studies 1 and 2 had mostly lost grandparents, parents, or spouses who did not have a substantial digital presence. Similarly, it meant a lot of the participants were areligious or non-practicing, and did not necessarily have strong views on an afterlife.

8.4.4 Analytical Limitations

Analysis of qualitative data was conducted by an individual researcher. Measures are often taken to ensure the veracity of qualitative analysis, such as intercoder reliability measures (dual coding). In the absence of these measures, the researcher discussed the data and analysis with their supervisors and employed thematic analysis which encourages continued analysis of data through iterative coding. Additionally, the applicability of the analysis methods used were discussed with, and well received by,

senior researchers at the Death Online Research Symposium as part of a PhD symposium, at an HCI methods summer school hosted by the University of Dundee and the Scottish Informatics and Computer Science Alliance (SICSA) , and at a series of PhD workshops hosted by SICSA annually throughout the course of the PhD.

8.4.5 Applicability of Findings

This thesis explored the identification of design goals and objectives for CC systems to support bereaved people with non-complicated grief. The majority of participants had experienced loss as a result of old age, or illness. As such, the findings and considerations may not be applicable in systems designed for those who have experienced traumatic loss such as through suicide or homicide, or that have experienced complicated grief as a result of bereavement.

Chapter 9

9 Conclusion

This thesis investigated the design, receptiveness to, and use of CC systems to support bereaved people. Study 1 confirmed bereaved people are receptive to the idea of CC systems being used and illuminated current reminiscence practices. The study confirmed that whilst physical possessions, presently, remain the most valued reminiscence aids, digital possessions are becoming increasingly relevant and impactful. The possessions mentioned by participants, and their interactions with them allowed for the identification of a series of design considerations for CC systems to support bereaved people. Study 2 confirmed that feelings of ownership over digital possessions co-created with a CC system can be increased: (1) through active and recent participation in the creation process; (2) by creating output reflective of the input; and, (3) by explaining the system, the creation process, and the user's role and impact. The findings from this study confirmed three of the design considerations identified in study 1 and contributed to the refinement of the considerations as a whole. Study 3 illustrated that support provided in a formal setting to bereaved people is person centred, and that practitioners seek to create a working relationship with their clients and a space in which clients feel safe expressing themselves. The study also confirmed that the main goal of formal interventions is to facilitate self-expression and education to better equip the person to adapt to, and process, their bereavement and grief. These understandings helped refine the design considerations from Study 1 further. The practitioners' evaluations of these considerations confirmed that all but one were seen as helpful for bereaved people. Study 4 confirmed that CC systems supported self-expression, the exploration of feelings, and reminiscence in a way that lessened the negative emotions often associated with the actions. The results of the WEMWBS also suggest that CC systems may prove more beneficial for younger generations who have grown up using digital technology. Based on an analysis of these findings the design considerations have been refined into a series of design objectives

intended to achieve two design goals. These goals and objectives form the main contribution of this thesis.

9.1 Summary of Contributions

Positioned at the intersection between HCI, CC, and psychology, this work contributes to the fields collectively by showcasing the potential of emerging technologies (that until now have not been explored) to support bereaved people, and individually by exploring the design and deployment of said systems and investigating their impact on users. The work herein has established that CC systems can be beneficially deployed to support bereaved people in similar ways to help offered by mental healthcare practitioners and in ways less advanced technology cannot. Additionally, a series of design goals and objectives through which CC systems can be designed to support bereaved people have been identified that take into account the capabilities of CC systems. These are that:

CC systems to support the bereaved should seek to achieve two goals:

1. Support self-expression
2. Promote wellbeing.

Developers, by achieving the following objectives, can create systems that meet these goals:

- Make systems widely available
- Give users control
- Explain the process
- Support individual and collaborative use
- Normalise bereavement and grief
- Provide an interactive experience
- Create reflective possessions
- Create meaningful, lasting possession(s)

9.2 Opportunities for Future Research

The design goals and objectives presented in this thesis can serve as a base from which researchers and technology designers who wish to use CC systems to support users can build from. We propose the following opportunities as rich avenues to extend the research conducted and reported in this thesis:

- **The makeup of the CC system**: CC systems can produce creative output in a variety of mediums including games[19], music, narratives, paintings, and poetry. The exploration of systems that produce artforms not explored herein would strengthen the argument for the development of CC systems, and could identify the most supportive art form for bereaved individuals. CC systems are also capable of producing artistic works with minimum or no user input (e.g. [28]. Autonomous CC systems could minimise user participation in the creation of possessions and lessen the likelihood of users experiencing emotional upset, but could limit any therapeutic benefits that result from self-expression. To create emotionally reflective possessions CC systems rely on sentiment analysis: another rich avenue of research would be to explore the minimum and optimum levels of accuracy for sentiment analysis and the impact accurate and inaccurate reflections can have on users. We know accurate sentiment analysis can increase ownership over possessions, create a connection between user and possession, and validate emotions expressed, but can inaccurate reflection lead to productive exploration of feelings?

- **System use**: Whilst our participants were receptive to CC systems that supported individual and collaborative use, our research focussed on individual use. Investigation of the impact that collaborative use of CC systems in a bereavement context can have would provide interesting information to refine design objectives to meet the goals identified herein.

[19] A mother and father, in 2016, created a game to memorialise and remember their deceased son Joel. For more information on the game, see: https://store.steampowered.com/app/419460/That_Dragon_Cancer/

- **The impact of demographics on interactions with CC systems**: Our results suggest people of all ages are receptive to the use of CC systems, but that younger generations are more likely to experience a positive change in their mental wellbeing (Chapter 7). The exploration of the impact that demographics has on the impact of CC systems would facilitate the creation of more supportive systems for specific groups of people. Additionally, the response to death and bereavement is likely experienced differently by a British atheist who does not believe in an afterlife, a French Christian who believes in Heaven, and an Indian Hindu who believes in the immortal soul and reincarnation. The impact of CC systems on those of different cultures and religions would shed light on what helps each the most and facilitate the design of local and global systems.

- **The type of death**: Our work, as a result of participant demographics, has largely focussed on natural death. An exploration of CC systems designed to support people who have experienced traumatic loss (e.g. suicide or homicide) could produce rich results that further inform the design of systems intended to support bereavement.

- **The distance from death for bereaved users**: Distance from death includes the time elapsed since the death of the deceased and the relationship the bereaved had with them (e.g. were they close or distant, brother or friend). The bereavement experience and grief felt in the immediate aftermath of loss is often different to that experienced more than 6 months later. Can CC systems be developed to support people in the immediate aftermath of loss? Do the design goals and objectives presented herein successfully support people, or are modifications required? Similarly, the bereavement experience and grief felt in reaction to the loss of a close friend is likely different to that of a distant acquaintance, how can CC systems support these different reactions?

- **The use of CC systems in other contexts**: CC systems have been shown to support bereaved users in carrying out actions associated with successful adaption to bereavement and the processing of grief. Participants have suggested CC systems could be beneficially employed in other contexts (e.g. complicated grief, relationship breakdowns, and PTSD), especially with users

who find it difficult to verbalise their thoughts and feelings. Research into additional use cases would produce rich data that could lead to increased support provided to others experiencing other mental health issues.

9.3 Final Remarks

Bereavement and grief are common human experiences. People who have experienced bereavement benefit from different levels of support (community or professional) that facilitate self-expression and engagement with bereavement related feelings. The appropriate support is not always available as and when needed, and bereaved individuals are increasingly turning towards technology to memorialise those they have lost and for social support. Most of the technology is not designed with the bereaved in mind and fails to consider additional benefits that the implementation of more advanced AI techniques may bring about.

In this thesis I have presented a series of design objectives and goals for CC systems intended to support the bereaved. These objectives and goals are based on the results of quantitative and qualitative data gathered from two stakeholder groups (bereaved users and mental healthcare practitioners). Systems that support self-expression and promote wellbeing by meeting the design objectives identified herein will ensure appropriate, supportive systems for bereaved individuals are created.

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Appendix A: Ethical Approval Forms

Study 1

Duncan of Jordanstone College of Art and Design

Dean
Professor Paul Harris FRSA

Lee Cheatley
PhD Student
DJCAD
University of Dundee

21 December 2017

Dear Lee

Approval of Ethics Application SDAD-17-RPG-0064: Continued Bonds

Thank you for your application for amendment to your ethics application as above which has now been reviewed. The review considered the following documents:

1. Checklist 1
2. Checklist 2
3. Application Form B
4. Participant Information Sheet
5. Consent Form
6. Session Guide

I am pleased to advise you that this application has now been approved.
Please note that you are responsible for monitoring the project on an on-going basis.
Your Supervisor is responsible for independently monitoring the project as appropriate.
The project may be audited during or after its lifetime by the University.

The School Research Ethics Committee should be notified of any adverse or unforeseen circumstances arising out of this study or of any emerging ethical concerns that you or your Supervisor may have about the research once it has commenced.

I wish you success with your project.

Kind regards

Jeanette Paul
Convenor SREC
Duncan of Jordanstone College of Art & Design

UNIVERSITY OF DUNDEE Dundee DD1 4HT Scotland UK *t* +44 (0) 1382 385251
email p.a.third@dundee.ac.uk | http://www.dundee.ac.uk/djcad

Study 2

Duncan of Jordanstone College of Art and Design

Dean
Professor Paul Harris FRSA

School of Art & Design Research Ethics Committee
Duncan of Jordanstone College of Art & Design (DJCAD)
University of Dundee
Dundee
DD1 4HN

Lee Cheatley
PhD Student

29 August 2018

Dear Lee

Application number: SDAD_18_RPG0123
Title: Continued Bonds: Ownership of Digital Possessions

I am writing to advise you that your ethics application has been reviewed and approved on behalf of the School of Art & Design (DJCAD) Research Ethics Committee.

Approval is valid for three years from the date of this letter. Should your study continue beyond this point, please request a renewal of the approval.

Any changes to the approved documentation (e.g., study protocol, information sheet, consent form) must be approved by this SREC.

Kind regards

Jeanette Paul
Convenor SREC
Duncan of Jordanstone College of Art & Design

Cc Fiona Fyffe-Lawson, SREC Administrator

UN[illegible]
email p.a.third@dundee.ac.uk | http://www.dundee.ac.uk/djcad

UNESCO City of Design Dundee
http://www.unesco.org/new/en/culture/themes/creativity/creative-cities-network/about-creative-cities/

Study 3

Duncan of Jordanstone College of Art and Design

Acting Dean
Professor Jeanette Paul

Lee Cheatley
PhD Student
DJCAD
University of Dundee

14 February 2019

Dear Lee

Approval of Ethics Application SDAD-19-RPG-0136: Continued Bonds: Expert Interviews

I am writing to advise you that your ethics application has been reviewed and approved on behalf of the School of Art & Design (DJCAD) Research Ethics Committee.

Approval is valid for three years from the date of this letter. Should your study continue beyond this point, please request a renewal of the approval.

Any changes to the approved documentation (e.g., study protocol, information sheet, consent form) must be approved by this SREC.

I wish you success with your project.

Kind regards

Prof. Jeanette Paul
Convenor SREC
Duncan of Jordanstone College of Art & Design

UNIVERSITY OF DUNDEE Dundee DD1 4HT Scotland UK *t* +44 (0) 1382 385251
email p.a.third@dundee.ac.uk | http://www.dundee.ac.uk/djcad

Study 4

Duncan of Jordanstone College of Art & Design
University of Dundee

DJCAD School Research Ethics Committee

University of Dundee
Dundee
DD1 4HN

8th November 2019

Dear Lee

Application Number: UOD-DJCAD-2019-0158

Title of Project: Continued Bonds: Song Creation 1 & 2

I am writing to advise you that your ethics application has been reviewed and approved on behalf of the DJCAD School Research Ethics Committee. Approval is valid for the duration of the project, as stated in the original application.

Any changes to the approved documentation (e.g., study protocol, information sheet, consent form) must be approved by this SREC before the changes are implemented. Requests for amendments should be requested using the Post-Approval Request for an Amendment form.

Approval is valid for the duration of the project, as stated in the original application. Should you wish your study to continue beyond the stated project end date, you must request an extension to this approval a minimum of 3 months before the project end date using the Post-Approval Request for an Extension form.

Yours sincerely

Sandra Wilson

Dr Sandra Wilson
Convener, DJCAD Research Ethics Committee

Appendix B: Study Material, Study 1

Information Sheet

PARTICIPANT INFORMATION SHEET

Project: **Continued Bonds**

Researcher: **Lee Cheatley**

Contact: **Prof. Wendy Moncur**

You are invited to conduct a tour of a relationship you have with someone who is alive, and subsequently a tour of a relationship you have with someone who is deceased. Both will be followed by an informal interview in which findings can be explored more in depth, and any issues discussed.

Before you decide whether or not to participate, please take the time to read this information sheet carefully and discuss it with others if need be. Please contact Lee Cheatley (l.e.cheatley@dundee.ac.uk) if something is unclear, or you want more information.

What is the study about?

Technology has become a large part of modern society. We document our everyday lives on social media, and are always connected. We create vast amounts of data about ourselves and others. This data can be used to help reminisce about the past, and our relationships with others, as can physical objects. This study will explore what people use to help reminisce about people they know now and before they died, how they interact with data on those living and those dead, and any sensitivities around this data.

Why have you been chosen?

You have been asked to participate in this study because you are between the ages of 18 and 30 and have been bereaved (experienced the death of someone close to you).

Do you have to take part?

No. If you do decide to take part you will be asked to read this information sheet thoroughly, and to sign a consent form. If you decide to take part, you can change your mind and decide to withdraw at any time. You do not need to give a reason for doing so. Withdrawing from the study will not impact you in anyway, and will have no consequences.

What does the study involve?

You will be asked to:

- Demonstrate* and discuss how you remember and reflect about people alive, and deceased.

*This will entail you showing the researcher what you use to help reminisce about people, or reflect. This could consist of private photos, social media (Facebook, Instagram, etc.) feeds, playlists, souvenirs or mementos.

These tours and discussions will be audio recorded, and photographs may be taken. These photographs recordings will only be accessed by the research team. Any photos with identifiable information will be made unrecognisable.

Are there any foreseeable risks or inconvenience in taking part?

You will be exploring and discussing private, and potentially sensitive and emotional matters. As such, there is a risk you become emotionally upset or distressed. If this occurs the researcher will be on hand to provide materials published by relevant charities and organisations that can help.

Anonymity and Confidentiality

Your privacy will be protected at all times. All personal information obtained from you during the study will be kept strictly confidential. It will not be used to identify you. Any information that could identify you as a participant will be stored in a password protected file or folder, or a locked filing cabinet, and will only be available to the researcher. Any information that is reported or published will not contain information that reveals your identity.

'The research project this study forms a part of is intended to finish in 2020. To allow for publication, all information collected in relation to this research will be deleted at the end of 2021.'

What will happen to the findings of the research study?

We may report on what we find out in academic conferences, journals and in the media. The results will be used to contribute to a better understanding of what is required to design technological support systems for the bereaved.

Right to Withdraw

You have the right to withdraw from this study at any time.

Complaint Procedure

If you have any complaints about any issues regarding the study or any of the proceedings of the study, please contact Prof. Wendy Moncur (contact details can be found below).

Contract for Further Information

The researcher will be happy to answer any questions you have before deciding whether to take part in this study. His contact details can be found below, as can his supervisors.

Researcher: Lee Cheatley

Duncan of Jordanstone College of Art and Design,

University of Dundee, Dundee, Scotland, UK, DD1 3DH

Email: l.e.cheatley@dundee.ac.uk

Supervisor: Prof. Wendy Moncur

School of Nursing and Health Sciences,

University of Dundee, Dundee, Scotland, UK, DD1 4HJ

Email: w.moncur@dundee.ac.uk

Thank you for your interest in this study

The University Research Ethics Committee of the University of Dundee has reviewed and approved this research study.

Consent Form

PARTICIPANT CONSENT FORM

Project: **Continued Bonds**

Researcher: **Lee Cheatley** (l.e.cheatley@dundee.ac.uk)

Contact: **Prof. Wendy Moncur** (w.moncur@dundee.ac.uk)

We would like you to take part in our research study. Before deciding, take time to understand why this study is being conducted, and what it involves for you. This includes reading the participant information sheet accompanying this form. If you are willing to take part, please tick the box labelled yes at the bottom.

I have **read** and **understood** the information provided.

I have had time to **consider** the information provided, and the opportunity to **make clear** anything I was unsure of.

I am **aware** of what is expected of me in the study, and the potential risks.

I **understand** my words may be quoted in publications, reports, web pages, and other outputs.

I **understand** that taking part is voluntary. I can withdraw from the study at any time and I do not have to give any reasons for why I don't want to take part.

I **understand and agree** that the data collected for this project will be stored in a secure University location, in accordance with the Data Protection Act 1998, and will be available only to the research team.

I **understand** that other researchers will have access to this data only if they agree to preserve the confidentiality of the information as requested in this form.

I **understand** that the information I give will only be used anonymously (without my name)

I **agree to** photographs being taken and **understand** these will be anonymised.

I **consent** to my participation being audio-recorded.

	YES	NO
I **agree** to take part in this study *(Please tick appropriate box)*	☐	☐

_____ _____ ___/___/201__

Name of participant [printed] Signature Date

Demographics Form

Participant No. _____

Continued Bonds: Current Practices study

Participant demographics:

1. How old are you?

   _____

2. Circle the gender you most identify with:

   Male Female Other: _____

3. What is the highest level of qualification you currently have or are pursuing?
   (Please circle the corresponding qualification)
   a. None
   b. Secondary Education (standard grades, intermediates, nationals, or equivalent)
   c. Secondary Education (Highers/Advanced Highers)
   d. Post-Secondary Education (College, HNC/HND)
   e. Undergraduate Degree (BA, MA, BSc, MSc, etc.)
   f. Postgraduate Degree (MA, MSC, MLitt, etc.)
   g. Doctorate (PhD)
   h. Other _____

4. Are you religious?
   (Please circle the corresponding answer)

   Yes No

5. If yes, to which denomination, or how best would you describe your beliefs?
   (Examples: Atheist, Antitheist, Animist, Christian, Deist, Muslim, Theist, etc.)

   _____

Relationship Information

Demonstration 1: Possessions relating to someone who is alive

1. What is your relationship to the person to be discussed in this demonstration?
   (Example: Sibling, partner, nephew, or friend)

---

2. How close are you to the person (with 5 being very, and 1 being not at all)?

---

3. When did you last speak?
   (Either in person, or using technology. Please indicate this below as well)

Demonstration 2: Possessions relating to the deceased

1. What was your relationship to the deceased?
   (Example: Sibling, partner, nephew, or friend)

---

2. How close were you to the person (with 5 being very, and 1 being not at all)?

---

3. How long ago did you become bereaved?

Interview Guide

Session Guide - Study 1

Research Questions:

1. What are the current practices for remembering and reflecting on people and your relationship with them?
2. What objects are most commonly used to remember and reflect on people and relationships?
3. Do people interact with the data pertaining the deceased differently, if so, how so?
4. What data are people comfortable with outliving them, or those they have a relationship with?
5. What data are people comfortable with being used to generate artefacts about a relationship they have with a deceased person, or in the future someone may have with them upon their passing?

Preamble

Explanation of Study

Thank you for agreeing to take part in the study. If you want to re-read the information sheet or consent form you've been given previously I have copies here. If not, I'll give a quick reminder of what we'll be doing today.

In today's session I'll ask you to select someone alive you have a relationship with and ask you to demonstrate how you reminisce or reflect on this person or your relationship with them. Afterwards we'll have an informal discussion about these practices.

After this, I will again ask you to select someone you have a relationship with, but this time deceased, and ask you to demonstrate how you reminisce or reflect on this person or your relationship with them. Afterwards we'll have a brief discussion about these practices, and any differences from the previous demonstration.

At the end I'd like to ask you a few questions about your relationship with each person and your experience of this study.

I have copies of the information sheet and consent forms here, if you'd like to re-read them before beginning. If you have any questions you would like to ask, I can answer those now.

Demographic Questionnaire

Before beginning, I'd like if you could fill in a demographic questionnaire to get some basic information from you.

Introduction

If participants struggle with the demonstration, a series of prompts may be issued in the form of questions:

- What possessions do you have that relate to the person?
- Are there certain times, such as anniversaries of events that prompt you to interact with these objects, or create new ones?

Demonstration One

Can you walk me through how you remember the person and reflect on your relationship with them? Explaining what you're doing, or the possession as you do so.

- Telling me the story behind each possession
- What comes to mind when you see or interact with this possession
- If the object was the opposite physicality, do you think your feelings around it would be different?

Demonstration Two

Can you walk me through how you remember the person and reflect on your relationship with them? Explaining what you're doing, or the possession as you do so.

- Telling me the story behind each possession
- What comes to mind when you see or interact with this possession
- Have your interactions with, or thoughts and feelings associated with the possessions changed since their death?
- If the object was the opposite physicality, do you think your feelings around it would be different?

Follow-up Discussion

1. How frequently do you find yourself looking at or interacting with these possessions?
   If they looked at them:
   a. What made you look at them in the past?
   b. Did it feel any different today compared with then?
   If never:
   c. Why haven't you looked at them before?
   d. How did it feel doing so today?
2. Do you feel any differently looking at or interacting with the possessions from the first demonstration than the second?
3. Do you perceive a difference in your feelings, frequency, or interactions with the possessions from demo 1 and demo 2?
4. How, if at all, have you interactions with the possessions from demo 2 changed since the person's death?
5. How do you feel about the deceased's objects out living them? Are there some possessions you're okay with and some you aren't?
6. What possessions, if any, would you be comfortable using to create new possessions to help commemorate the deceased and continue the bonds you have with them?

Codebook

Theme, subtheme	**Description**	**Example Quote**
Possessions and their properties	The possessions people interacted with when reminiscing, and their properties	"[degradation is]…what makes the possession more precious, that you can lose it, or it be destroyed. Also, what makes it scary, but mean more."
Interactions with possessions	How, why, how often, and the outcome of interactions with possessions	"I suppose remembering stuff could lead me on to looking at my Instagram account...I suppose it depends on how I'm feeling. If I'm feeling melancholic, I might have a look through, yeah. I suppose feelings and just remembering stuff to begin with might make me have a look through."
Privacy and permissions	Concerns relating to privacy of the bereaved and deceased and permission to use or interact with possessions	"I don't know, I think it is about empathising with the person if they were here. It would be on, I don't think that it matters how many people it is shared by. As long as when you look at it and you feel that they would be okay with you using it then that would be fine."
Contrasts in interactions with and properties of possessions Contrasts between digital and physical possessions	Participant preference related to most favoured form of possession and those they interact with most	"I think the writing would matter more. If I had physical copies of the writing, or poetry, they would mean more to me. If the teddy bear was digital it would take away [from it]. It is the actual

		contact you get from it, or wearing the necklace or putting on the face cream. It is the connection, the act of putting it on. But then you wouldn't have the fear of losing it. It feels like you put more effort into it if it is physical but then there is the fear of losing it or it being destroyed. When it is digital it is permanent. It is always there, as long as you've got it saved, I guessed. I feel more bonded or connected with both physical and digital, it is just different. It is hard because I would have always said physical [is my preferred] but when you think about it I think I rely a lot more on the digital."
Contrasts between possessions related to someone alive and the deceased	The differences in how, why, and the outcome of interactions with possessions related to someone alive and someone deceased	"Yes (laughs), I almost cried talking about the second one – the one related to my grandma – but the one with [boyfriend's name] was all happy and stuff, fun stuff that, well it sort of makes me think of it."
Factors that influence receptiveness towards CC systems	Participant receptiveness towards CC systems including what they would like systems to do and what they wouldn't.	"I mean if it was something physical that was going to be sort of destroyed to then create something new I'm not so sure about that, because there is always the thing of if you didn't like it and it was something you loved

		destroyed to create it, it would be quite sad, but if it was something like text that she had written or something digital again that could be, you could still keep the original as well as have something else, that would be quite cool."

Appendix C: Study Material, Study 2

Information Sheet

PARTICIPANT INFORMATION SHEET

Project: **Continued Bonds: Ownership of Digital Possessions**

Researcher: **Lee Cheatley**

Contact: **Dr Alison Pease**

You are invited to participate in an online questionnaire through which you will explore feelings of ownership you have (or don't have) over digital possessions. You will be asked to access a social media account, to visit a website set up for the study, and to write a short piece of text about a memory or how you're feeling on the day of participation.

The study is broken into 7 brief sections. With section 1 – 6 each containing 3 questions, and section 7 containing 2 questions. The questions in section 1 are demographic based, asking your gender, age, and country of residence. The questions in sections 2 – 6 consist of you retrieving or writing a short piece of text, and exploring the level of ownership you have, or don't have, over it, and why. Finishing with section 7 which has you explore ownership of all the possessions from previous sections in relation to each other. Additional information is provided throughout the questionnaire.

Before you decide whether or not to participate, please take the time to read this information sheet carefully and discuss it with others if need be. Please contact Lee Cheatley (l.e.cheatley@dundee.ac.uk) if something is unclear, or you want more information.

What is the study about?

Technology has become a large part of modern society. We document our everyday lives on social media, and are always connected. We create vast amounts of data about ourselves and others. This data can be accessed by people we didn't account for, or in ways we didn't anticipate. This has contributed to diverse feelings of ownership over digital possessions, dependant on person and possession. This study will explore these feelings of ownership, or the lack of, over digital possessions. Investigating what contributes to feelings of ownership, and what contributes to a lack of perceived ownership.

Why have you been chosen?

You have been asked to participate in this study because you:

- are between the ages of 18 and 33
- speak English fluently
- have access to and use social media

Do you have to take part?

No. If you do decide to take part you will be asked to read this information sheet thoroughly, and to sign a consent form. If you decide to take part, you can change your mind and decide to withdraw at any time. You do not need to give a reason for doing so. Withdrawing from the study will not impact you in anyway, and will have no consequences.

What does the study involve?

You will be asked to complete an online questionnaire. The questionnaire is comprised of 7 sections. The first of which asks simple demographic questions: which gender you associate with, what age you are, and where you live. The next 5 sections ask you to retrieve or write short pieces of text, and either explore whether you have any feelings of ownership over these, or new possessions created from these, and what contributes to these feelings of ownership, or lack thereof.

To keep track of the text participants will be asked to copy and paste the writing into a text document (such as notepad or Microsoft word). To create new possessions participants will be asked to visit a website run by the researcher for the purpose of this study.

Are there any foreseeable risks or inconvenience in taking part?

You will be exploring and writing about your personal lives or how you're feeling. As such there is a risk you become emotionally upset or distressed. If this occurs the researcher will be on hand to provide materials published by relevant charities and organisations that can help. The researchers email is l.e.cheatley@dundee.ac.uk

Anonymity and Confidentiality

Your privacy will be protected at all times. All personal information obtained from you during the study will be kept strictly confidential. It will not be used to identify you. Any information that could identify you as a participant will be stored in a password protected file or folder, or a locked filing cabinet, and will only be available to the researcher. Any information that is reported or published will not contain information that reveals your identity.

The research project this study forms a part of is intended to finish in 2020. To allow for publication, all information collected in relation to this research will be deleted at the end of 2022.

What will happen to the findings of the research study?

We may report on what we find out in academic conferences, journals and in the media. The results will be used to contribute to a better understanding of what is required to design technological support systems for the bereaved.

Right to Withdraw

You have the right to withdraw from this study at any time.

Complaint Procedure

If you have any complaints about any issues regarding the study or any of the proceedings of the study, please contact Dr Alison Pease (contact details can be found below).

Contract for Further Information

The researcher will be happy to answer any questions you have before deciding whether to take part in this study. His contact details can be found below, as can his supervisors.

Researcher: Lee Cheatley

Duncan of Jordanstone College of Art and Design,

University of Dundee, Dundee, Scotland, UK, DD1 3DH

Email: l.e.cheatley@dundee.ac.uk

Supervisor: Dr Alison Pease

School of Science and Engineering,

University of Dundee, Dundee, Scotland, UK, DD1 4HJ

Email: a.pease@dundee.ac.uk

Thank you for your interest in this study

The University Research Ethics Committee of the University of Dundee has reviewed and approved this research study.

Consent

Consent is given by the participant during completion of the questionnaire. People are presented with the below statements and asked to indicate that they have both read and agree to these before being allowed to progress through the questionnaire.

Before deciding whether or not to participate in this study it is important you agree with the following statements:

- I have read and understood the information provided herein, and in the information sheet. I have had the opportunity to consider the information, to ask questions, and have these answered satisfactorily.
- I confirm I am willing to participate in the study
- I understand that my taking part is voluntary; I can withdraw from the study at any time and I do not have to give any reasons for why I no longer want to take part.
- I understand my data will be completely anonymised
- I agree for the data I provide to be archived at the named researcher's discretion
- I understand that my words may be quoted in publications, reports, web pages, and other research outputs (if applicable; e.g. for interviews).
- I understand that other genuine researchers may use my words in publications, reports, web pages, and other research outputs, only if they agree to preserve the confidentiality of the participant and information as requested in this form.

If you would like to take part please click the box below. By selecting this box you are agreeing to the list of statements above.

- This study has been explained to me. I volunteer to take part in this research and indicate my consent by selecting this box. I have read and understood this consent form, and any additional materials or correspondence.

Survey (including consent form)

Study 2

Page 1: Welcome to the survey

Welcome to the survey.
This survey explores the levels of ownership we may or may not feel over digital possessions. Before you decide whether or not to take part in the survey it is important you to understand what participation involves.

Please read the information on the following page carefully. If anything is unclear please feel free to email us (l.e.cheatley@dundee.ac.uk) before deciding whether or not to take part. The study is being run by researchers at the University of Dundee.

Page 2: Study Information

What is the purpose of the research?
To help us explore feelings of ownership over digital possessions.

What does the study involve?
You retrieving, and writing short pieces of text, and generating poems using these as input. You will be asked to explore whether you have any feelings of ownership over these digital possessions, and what contributes to these feelings of ownership, or the lack of ownership felt.

You will also be asked to access one of your social media accounts, an external website managed by the researcher for the purpose of this study, and to open a text document to store some answers from earlier questions for reference later in the study.

Are there any risks associated with taking part?
You will be asked to write about memories you have about a relationship or an event, or your feelings. As such there is a small risk of you becoming emotionally upset. If this occurs you may contact the researcher who will be on hand to provide materials published by relevant charities and organisations that can help. The researchers email is l.e.cheatley@dundee.ac.uk

Will anyone know what I do or say during the experiment?
Your privacy will be protected at all times. All personal information obtained from you during the study will be kept strictly confidential. Any information that could identify you as a participant will be anonnymised. The research project this study forms a part of is intended to finish in 2020. To allow for publication, all information collected in relation to this research will be deleted at the end of 2022.

Page 3: Consent

Before deciding whether or not to participate in this study it is important you agree with the following statements:

- I have read and understood the information provided
- I confirm I am willing to participate in the study
- I understand I can withdraw from the study at any point, without having to provide a reason
- I understand my data will be completely anonymised
- I agree for the data I provide to be archived at the named researcher's discretion
- I understand my data may be used in publications, reports, web pages, and other research outputs (if applicable, e.g. for interviews).

1. If you would like to take part please click the box below. By selecting this box you are agreeing to the list of statements above. ✱ *Required*

○ This study has been explained to me. I volunteer to take part in this research and indicate my consent by selecting this box. I have read and understood this consent form.

Page 4: Demographics

In this section we will ask you a few simple questions about yourself.

2. Which gender do you associate with?

- ○ Male
- ○ Female
- ○ Other

2.a. If you selected Other, please specify:

3. What age are you?

- ○ 18 - 24
- ○ 25 - 34

4. In which country do you currently live?

- ○ Scotland
- ○ England
- ○ Wales
- ○ Northern Ireland

5. In which country were you born?

Please enter a response that only contains letters.

Page 5: Social Media Post

6. In a new internet window or tab, or on your phone, open a social media site or blog you use and select a piece of writing or text you've posted that has some meaning to you. Enter it into the box below, and paste it into a text document for later.

7. Looking at the social media post from the previous question, can you adjust the slider below to indicate the **level of ownership you feel** over it? With **0** meaning you **feel no ownership** over it, and **4** meaning you **feel a strong sense of ownership** over it.

Please don't select more than 1 answer(s) per row.

Please select at least 1 answer(s).

	0	1	2	3	4
Feelings of ownership over social media post	☐	☐	☐	☐	☐

8. Can you tell us **what makes you feel this level of ownership** over the social media post? **(Including reasons that do and don't make you feel ownership over it)**

Page 6: Ownership over text just written

In this section we will have you write a short piece of text. You will also be asked to store this in the text document from earlier, under the social media post.

9. **1) Write** a short piece of text about a **happy memory** you have with or about somebody **in the text box below**.
2) Before submitting, **paste a copy of it into the text document** under the social media post you stored there for Question 1.

10. Looking at what you wrote for the previous question, can you adjust the slider below to indicate the level of ownership you feel over it? With 0 meaning you feel no ownership over it, and 4 meaning you feel a strong sense of ownership over it.

Please don't select more than 1 answer(s) per row.

Please select at least 1 answer(s).

	0	1	2	3	4
Feelings of ownership over what you've just written	☐	☐	☐	☐	☐

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11. Can you tell us what makes you feel this level of ownership over the social media post? (Including reasons that do and don't make you feel ownership over it)

Page 7: Ownership over Poem 1

In this section Poem 1 will be generated using the social media post or text you retrieved and stored in a text document earlier.

12. **1) Go to** the following website (https://compoetry.eu-gb.mybluemix.net/)

2) Paste the social media post you selected for Question 1 **into the** "How are you feeling?" **text box**.

3) Click Generate Poem, you may have to do this twice if it gives you the following error message: "Sorry. This feature didn't work."

4) Paste the Poem into the box below, and **into the text document** under the social media post and text about a memory you already have stored there.

13. Looking at Poem 1, can you adjust the slider below to indicate the **level of ownership you feel** over it? With **0** meaning you **feel no ownership** over it, and **4** meaning you **feel a strong**

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sense of ownership over it.

	0	1	2	3	4
Feelings of ownership over Poem 1	☐	☐	☐	☐	☐

14. Can you tell us what makes you feel this level of ownership over the social media post? (Including reasons that do and don't make you feel ownership over it)

Page 8: Ownership over Poem 2

In this section you will be asked to visit the website again, but this time write a new piece of text about a memory you have about or with someone.

15. **1) Open a new tab**, and the **website again**. (https://compoetry.eu-gb.mybluemix.net/)
2) This time, **write about a memory you have** related to somebody, or **how you're feeling** today into the "How are you feeling?" text box.
3) Click Generate Poem, you may have to do this twice if it gives you the following error message: "Sorry. This feature didn't work."
4) **Paste what you wrote** in the "How are you feeling?" text box in the box below, and **keep the website open**
5) **Paste the Poem** into the box below, at the bottom, **and into the text document** under Poem 1.

16. Looking at Poem 2, can you adjust the slider below to indicate the **level of ownership you feel** over it? With **0** meaning you **feel no ownership** over it, and 4 meaning you **feel a strong sense of ownership** over it.

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	0	1	2	3	4
Feelings of ownership over Poem 2	☐	☐	☐	☐	☐

17. Can you tell us **what makes you feel this level of ownership** over the text you've just written? **(Including reasons that do and don't make you feel ownership over it)**

Page 9: Ownership over Poem 3

In this section you will be asked to visit the website again, and to write a new piece of text about a memory you have about or with someone. Unlike the previous two poetry generation sections, after you generate and submit the input and poem you will be presented with information explaining how and why it was generated.

18. **1)** Open a new tab, and the website again. (https://compoetry.eu-gb.mybluemix.net/)
2) This time, **write about a memory you have related to somebody, or how you're feeling today** into the "How are you feeling?" text box.
3) Click **Generate Poem**, you may have to do this twice if it gives you the following error message: "Sorry. This feature didn't work."
4) Paste what you wrote in the "How are you feeling?" text box **into the box below**, and **keep the website open**.
and the **poem generated from it** into the **box below**.
5) Paste the Poem into the box below, at the bottom, and into the text document under Poem 2.

The system generated this Poem (Poem 3) **based on what you wrote** in the "How are you

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feeling?" text box. The system looked at **your word usage**, and calculated the **emotion in each of the words you used** and **tried to create a poem of a similar emotion to the words you used**. **Your participation** in the creation process **led to the system generating a poem reflective of the memory you shared, and the words you used.**

19. Looking at Poem 3, can you adjust the slider below to indicate the **level of ownership you feel** over it? With **0** meaning you **feel no ownership** over it, and 4 meaning you **feel a strong sense of ownership** over it.

	0	1	2	3	4
Feelings of ownership over Poem 3	☐	☐	☐	☐	☐

20. Can you tell us **what makes you feel this level of ownership** over the text you've just written? **(Including reasons that do and don't make you feel ownership over it)**

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Page 10: Ownership Rankings

In this section you will be asked to look at the text and poems from the previous questions, and consider which you feel the most ownership over, and which you feel the least ownership over.

21. Looking at the social media post, the text you wrote, and all 3 of the poems you created drag them below into the order of ownership you feel over them. With the one you feel the most ownership over being at the top, and the least at the bottom.

	0	1	2	3	4
Social Media Post	☐	☐	☐	☐	☐
Text you wrote	☐	☐	☐	☐	☐
Poem 1	☐	☐	☐	☐	☐
Poem 2	☐	☐	☐	☐	☐
Poem 3	☐	☐	☐	☐	☐

22. Can you explain the levels of ownership you feel over these items, and why you have ranked them in the order you have?

Page 11: End

Thank you for taking part in our study. Click here to confirm completion and be redirected to the Prolific completion page.

Codebook

Theme, subtheme	**Description**	**Example Quote**
Ownership	References to the two types of ownership (legal and psychological)	"I don't feel ownership in the sense of property, more emotional ownership in the sense of 'these are my words.'"
Factors that influenced perceived ownership	What contributed to or lessened feelings of ownership over digital possessions	
Participation	The impact of active involvement in the creation process	"The items that I personally wrote I feel more ownership over"
Personal Touch	The impact of possessions that felt personal	"It was read at our wedding, so I feel I have a personal connection to it."
Reflective output	The impact of possessions reflective of emotional/personal content of input	"Feeling nearly full ownership as my words and feelings generated this poem based on those words."
Control	The impact of feelings of control over the possessions	"I created the post and can edit or delete it if I want."
Meaning	The impact of meaning being attributed to possessions	"it is something I was proud of and wanted to post."
Framing Information	The impact of explanatory information	"I felt more ownership as time went on due to the explanation of how the generator worked."

Appendix D: Study Material, Study 3

Information Sheet

PARTICIPANT INFORMATION SHEET

Project: **Continued Bonds: Expert Interviews**

Researcher: **Lee Cheatley**

Contact: **Dr Alison Pease**

You are invited to participate in a semi-formal interview in which you will discuss your experiences as a mental health care professional either supporting the bereaved, employing creative arts therapy, or both. You will then be presented with a series of 10 design recommendations for a computer system that could support you in your work or support the bereaved at home. You will be asked to evaluate these individually, and as a whole system. The researcher will be there to answer any questions you may have or provide more detail should you wish it.

Before you decide whether or not to participate, please take the time to read this information sheet carefully and discuss it with others if need be. Please contact Lee Cheatley (l.e.cheatley@dundee.ac.uk) if something is unclear, or you want more information.

What is the study about?

Bereavement is a problem we will all face multiple times throughout our lives. As a phenomenon it is still not fully understood, but multiple means of supporting the bereaved, and treating grief have been used to varying levels of success. Creative Arts Therapy is one such avenue of support and method of treatment, and like most of these faces both benefits and drawbacks. This study will investigate the experience of mental health care practitioners of supporting the bereaved, and/or employing creative arts therapy. Exploring what they see as the positives and negatives of creative arts therapy, and whether a system designed with our 10 design recommendations could be beneficial either in a professional setting and/or in a personal setting.

Why have you been chosen?

You have been asked to participate in this study because you:

- Must be over the age of 18
- Speak English fluently
- Either work with the bereaved, or practice Creative Arts Therapy

Do you have to take part?

No. If you do decide to take part you will be asked to read this information sheet thoroughly, and to sign a consent form. If you decide to take part, you can change your mind and decide to withdraw at any time. You do not need to give a reason for doing so. Withdrawing from the study will not impact you in anyway, and will have no consequences.

What does the study involve?

To begin with you will take part in a semi-formal interview in which you will briefly be asked some demographic questions, and then be asked to explore your experiences as a mental healthcare

practitioner and/or a creative arts therapist. You will be asked to discuss methods and techniques you use, to consider creative arts therapy (if you don't employ it), and from your own experience or in your own opinion explore potential benefits and drawbacks of creative arts therapy to support the bereaved. You will then be presented with a small summary of computational creativity and computational creative machines, one of which will be available to test out. You will then be asked to explore whether such a system could be useful in a professional setting, and in a personal setting, and to provide any recommendations for the design of such a system. After this you will be presented with a series of 10 design recommendations based on our previous research, in written and picture form. You will be asked to explore whether you think such a system could be useful in a professional setting, and in a personal setting, and to explore each of the 10 design recommendations individually. The session will end with a debriefing, during which the researcher will provide an overview of their project and work to date, how the data will be used, and how and where materials related to the project or this study will be available if participants wish to access them.

Are there any foreseeable risks or inconvenience in taking part?

You will be exploring and discussing your experiences as a mental healthcare practitioner, or a creative arts therapist. As such there is little risk of you become emotionally upset or distressed. However, if this does occur the researcher will be on hand to provide materials published by relevant charities and organisations that can help. The researcher's email is l.e.cheatley@dundee.ac.uk

Anonymity and Confidentiality

Your privacy will be protected at all times. All personal information obtained from you during the study will be kept strictly confidential. It will not be used to identify you. Any information that could identify you as a participant will be stored in a password protected file or folder, or a locked filing cabinet, and will only be available to the researcher. Any information that is reported or published will not contain information that reveals your identity.

The research project this study forms a part of is intended to finish in 2020. To allow for publication, all information collected in relation to this research will be deleted at the end of 2022.

What will happen to the findings of the research study?

We may report on what we find out in academic conferences, journals and in the media. The results will be used to contribute to a better understanding of what is required to design technological support systems for the bereaved.

Right to Withdraw

You have the right to withdraw from this study at any time.

Complaint Procedure

If you have any complaints about any issues regarding the study or any of the proceedings of the study, please contact Dr Alison Pease (contact details can be found below).

Contract for Further Information

The researcher will be happy to answer any questions you have before deciding whether to take part in this study. His contact details can be found below, as can his supervisors.

Researcher: Lee Cheatley

Duncan of Jordanstone College of Art and Design,

University of Dundee, Dundee, Scotland, UK, DD1 3DH

Email: l.e.cheatley@dundee.ac.uk

Supervisor: Dr Alison Pease

School of Science and Engineering,

University of Dundee, Dundee, Scotland, UK, DD1 4HJ

Email: a.pease@dundee.ac.uk

Thank you for your interest in this study

The University Research Ethics Committee of the University of Dundee has reviewed and approved this research study.

Consent Form

Consent Form for Continued Bonds: Expert Interviews

Please tick the appropriate boxes	**Yes**
Taking Part	
I have read and understood the project information sheet.	☐
I have been given the opportunity to ask questions about the project.	☐
I agree to take part in the project.	☐
I consent to my participation being audio-recorded.	☐
I understand that my taking part is voluntary; I can withdraw from the study at any time and I do not have to give any reasons for why I no longer want to take part.	☐
I understand that my words may be quoted in publications, reports, web pages, and other research outputs *(if applicable; e.g. for interviews)*.	☐
Use of the information I provide beyond this project	
I agree for the data I provide to be archived at the at the University of Dundee.[1]	☐
I understand that other researchers will have access to this data only if they agree to preserve the confidentiality of the information as requested in this form.	☐
I understand that other genuine researchers may use my words in publications, reports, web pages, and other research outputs, only if they agree to preserve the confidentiality of the information as requested in this form.	☐

_____	_____	_____
Name of participant [printed]	Signature	Date

Researcher: **Lee Cheatley** (l.e.cheatley@dundee.ac.uk)
Contact: **Dr Alison Pease** (a.pease@dundee.ac.uk)

Notes:

1. Data will be stored on the lead researcher's university issued, password protected laptop, and the researcher's university issued, password protected box online storage account.

Interview Guide

Role + Personal Experience Questions

(So, you obviously work with the bereaved, can you tell me a little bit more about your role and what it entails?) What is your current role in the mental health field?

What attracted you to this area?

For how long have you worked in this area?

What is your approach to therapy? (What methods do you use, and why?)

Can you walk me through what a typical, if you can imagine such a thing, session might be like?

What do you feel the most useful aspects of this approach are?

What do you feel the most problematic areas of this approach are?

Can you give me any examples of cases where you have used these methods successfully?

Can you give me any examples of cases where you have used these methods unsuccessfully?

How well do you feel these approaches have served you in general?

What makes you feel that way?

Have you ever used any other methods or techniques?

How do you feel those sessions went?

What made you change methods?

What do you think are the most important things to be considered when working to support the bereaved?

CAT Questions

Have you ever considered using CAT?

Why?

What made you try it out/What put you off?

What did you make of using these CAT methods?

Why do you no longer use them?

"Give me more" Questions

What attracted you to this…

How did you feel about…

Can you describe…Can you tell me more…

Can you take me through your decision process?

"So what you're saying is…"

That's really helpful/interesting, can you tell me more about that?

Can you describe what made it difficult or useful?

Evaluation Questions

What makes you feel that way about this recommendation?

How do you foresee it impacting negatively or positively?

What could be changed to remedy this? Or to improve it?

Do you feel a system designed with these recommendations could be helpful for the bereaved in a home setting?

Do you feel a system designed with these recommendations could be helpful for the bereaved in a formal setting?

Codebook

Theme, subtheme	**Description**	**Example Quote**
Promote Participation	The ways therapists seek to encourage clients to engage with bereavement support	
Access	The impact of access on participation	"…more and more people are accessing things online. So, I think then they can access it [CC support system] from their home, in private, or elsewhere on the move with smartphones on to go. I think online is useful, a useful resource. So many self-help things are online now that that is where people tend to look, and they don't have to go to a library or a book shop."
Client Driven	How and why participants employed client driven and directed support	"I was say that depends on the individual and that is another reason I like the person-centred approach to working with grief because it appreciates these subjective experiences of the individual."
Support Expression in many forms	How and why participants supported users to express themselves however they feel most able	"Supporting whatever way they feel most comfortable, because the first thing you have to do is make a client feel comfortable because if they don't feel comfortable they wont come back."

	Informed by bereavement theories	How and why participants provided support aligned with prevailing theories of bereavement and grief	"Again, in terms of theories and research my favourite model to use it the dual process model. So, Stroebe and Schut, I just love that and I think people respond to that phenomenally well. Also, the transition curve, I think people like that. I don't tend to use the older more linear Kuebler Ross stage models. They can be useful and sometimes I will offer them, but not in that linear way. You know explaining that these phases may come and go and shift and change…"
	Provide a safe space	How and why participants sought to provide clients with a space in which bereaved people can express themselves without fear of judgement	"Again, if people don't feel safe then they will be very reluctant to open up and because it is a very personal thing – opening up your innermost feelings to somebody whether it's a person, a stranger, or a computer."
	Contextualise	How and why participants explained the support provided	"Yes, I mean I think anything that is about dealing with issues needs to be providing explanation, so people can understand the process."
	Build a relationship or familiarity	How and why participants sought to form a working relationship	"…I think it is the relationship that you build with the client that is paramount, because if you can't do that you haven't

		got anything else to fall back on."
Treat the client with unconditional positive regard	How and why participants treated clients with unconditional positive regard	"I think that and just being consistent, being trustworthy, being open. She knows what I'm about, she knows what I'm doing, she knows what this is, so that all makes it safe and because I'm not coming back saying you should have done that or have you tried this? She just explored stuff and let it out."
Promote Wellbeing Normalise	How and why participants educated the bereaved about bereavement	"There's definitely an element of educating people as to what bereavement is about and what it means, what the research is, what is quite common, so I give people handouts that people will often find really helpful in terms of understanding the process they're going through because it normalises what they're experiencing because I think we don't talk about bereavement very much and although people die all the time people don't quite know what to expect as an experience of that, and people often feel like they're going a bit mad because their emotions are so extreme or high pitched and intense."

	Hear them out and help them understand	How and why participants listen and facilitate understanding	"I suppose there is an element of reflecting back what I hear and what they are saying and them hearing that back again allows them to also accept it and acknowledge it."
	Create a connection	How and why participants created a connection between bereaved and deceased (including through a possession that serves as a conduit between bereaved and deceased)	"Because one of the things I found comes up quite commonly is people who will say they don't want to visit a grave, they don't find any connection but they feel guilty about it and sometimes along the lines of normalising it in a way saying you can create your own rituals. Meaning you can create your own ways of staying connected with somebody, you know continuing bonds and things like that. So, sometimes this is part of the work, or gain in line with the sort of unfinished business sometimes I have suggested 'have you considered writing a letter to say those things that you wanted to say and to explain how things are and then what you do with that letter is up to you.'"
	Assess wellbeing	How and why participants monitored how the bereaved is doing, and whether they are doing better than they were.	"Yes, absolutely. Again, this is a ploy that we often involve in bereavement counselling. Write down what you#re feeling if you are finding it difficult to verbalise, and

		some people do find it difficult to verbalise and some people find it easy to write it down…and you can reflect back on this in a months' time and see if you still feel this way."
Signpost additional help	How and why participants directed bereaved people to other sources of support if necessary	"Listen and support and know when perhaps somebody else can help as well. Don't be so, not protective but precious, about what you can do. Know that you've got your place but there may be a psychology output somewhere or there may be another service that an just add a little bit into the mix that you're needing at that time."

Appendix E: Study Material, Study 4

Information Sheet

PARTICIPANT INFORMATION SHEET

Project: **Continued Bonds: Song Creation 1**

Researcher: **Lee Cheatley**

Contact: **Prof. Wendy Moncur**

You are invited to test a creative computer that collaborates with users to create music. In this study you will be asked to collaborate with a computationally creative computer to create a song. After you create the song you will be asked a series of questions about your experience creating the song and listening to it.

Before you decide whether or not to participate, please take the time to read this information sheet carefully, and discuss it with others if you want to. Please contact Lee Cheatley (l.e.cheatley@dundee.ac.uk) if something is unclear, or you want more information about the project.

What is the study about?

This study explores the effectiveness of a creative computer system that collaboratively creates music with people who have been bereaved.

Why have you been chosen?

You have been asked to participate in this study because you:

- are over the age of 18
- speak English fluently
- have been bereaved in the last 7 years

Do you have to take part?

You do not have to take part.

If you do decide to take part, you will be asked to read this information sheet thoroughly, and to sign a consent form.

You can change your mind and decide to withdraw from the study at any time. You do not need to give a reason for doing so. Withdrawing from the study will not impact you in anyway, and will have no consequences.

What does the study involve?

You will be asked to fill out a form with your age, gender, etc, to collaboratively create a song with the system and answer a series of questions after you create the song. Additionally, before and after creating and listening to the song you will be asked to fill out a Wellbeing Scale (Warwick-Edinburgh Mental Wellbeing Scale). You will be asked to write text related to your bereavement (how you feel about it currently, memories you have of the person you have lost, etc) or the person you have lost.

Are there any foreseeable risks or inconvenience in taking part?

You will be asked to write about your feelings in relation to bereavement that you have experienced. As such there is a risk that you become emotionally upset or distressed. If this occurs the researcher will be on hand to provide materials published by relevant charities and organisations that can help. The researcher's email is l.e.cheatley@dundee.ac.uk

Anonymity and Confidentiality

Your privacy will be protected at all times. All personal information obtained from you during the study will be kept strictly confidential. It will not be used to identify you. Any information that could identify you as a participant will be stored in a password protected file or folder, or a locked filing cabinet, and will only be available to the researcher. Any information that is reported or published will not contain information that reveals your identity.

The research project this study forms a part of is intended to finish in 2020. To allow for publication and to meet the expectations of the researcher's funding body (Engineering and Physical Science Research Council) information collected in relation to this research will be anonymised and stored indefinitely.

What will happen to the findings of the research study?

We may report on what we find out in academic conferences, journals and in the media. The results will be used to contribute to a better understanding of what is required to design technological support systems for the bereaved.

Right to Withdraw

You have the right to withdraw from this study at any time.

Complaint Procedure

If you have any complaints about any issues regarding the study or any of the proceedings of the study, please contact Prof. Wendy Moncur (contact details can be found below).

Contract for Further Information

The researcher will be happy to answer any questions you have before you decide whether to take part in this study. His contact details can be found below, as can his supervisors.

Researcher: Lee Cheatley

School of Art and Design

University of Dundee, Dundee, Scotland, UK, DD1 3DH

Email: l.e.cheatley@dundee.ac.uk

Supervisor: Prof. Wendy Moncur

School of Art and Design | School of Nursing and Health Sciences

University of Dundee, Dundee, Scotland, UK, DD1 4HJ

Email: w.moncur@dundee.ac.uk

Thank you for your interest in this study

The University Research Ethics Committee of the University of Dundee has reviewed and approved this research study.

Consent Form

Consent Form for Continued Bonds: Song Creation

Please tick the appropriate boxes	**Yes**	**No**
Taking Part		
I have read and understood the project information sheet.	☐	☐
I have been given the opportunity to ask questions about the project and my answers have been answered to my satisfaction.	☐	☐
I consent to my participation being audio-recorded.	☐	☐
I agree to take part in the project.	☐	☐
I understand that my taking part is voluntary; I can withdraw from the study at any time and I do not have to give any reasons for why I no longer want to take part.	☐	☐
I understand that my words may be quoted in publications, reports, web pages, and other research outputs *(if applicable; e.g. for interviews).*	☐	☐
Use of the information I provide beyond this project		
I agree for the data I provide to be archived at the University of Dundee.[1]	☐	☐
I understand that other researchers will have access to this data only if they agree to preserve the confidentiality of the information as requested in this form.	☐	☐
I understand that other researchers may use my words in publications, reports, web pages, and other research outputs, only if they agree to preserve the confidentiality of the information as requested in this form.	☐	☐
I give permission for data collected from me, in anonymised form, to be stored and shared in line with the expectations of the researcher's funding body (Engineering and Physical Sciences Research Council).	☐	☐

_____ _____ _____

Name of participant [printed] Signature Date

Researcher: **Lee Cheatley** (l.e.cheatley@dundee.ac.uk)
Contact: **Prof. Wendy Moncur** (w.moncur@dundee.ac.uk)

[1]Data will be stored on the researcher's university issued, password protected laptop, and the researcher's university issued, password protected box online storage account.

Interview Guide

Song Creation 1: Interview

General Questions: Co-Creation

1. How would you describe your experience of creating a song with the system? [RQ1,2]
2. What are your feelings about the creation experience? [RQ1,2]
3. How much control do you feel you had creating the song? [RQ3]
4. How would you describe the song you have created with the system? [RQ1,2]
5. What are your feelings about the song? [RQ1,2]
6. How well did the system help you engage with your loss? For example, how well did it help you think about and/or remember the person you have lost, how you feel about the loss, or recall particular memories. [RQ1]
    a. How did it help, and why do you feel this was helpful? Would you change anything about it/what could be done to improve this?
    b. How did it hinder, and why do you feel this was not helpful? Would you change anything about it/what could be done to improve this?
7. How well did the system help distract you from your loss? For example, at any point did you get distracted from thoughts of loss and begin to focus on the song (creating and/or listening to it) like you might when watching tv, working, or exercising? [RQ1]
    a. If it did, do you feel this was helpful? Why?
    b. If it did not, do you feel this not helpful? Why?
8. How did you feel when you wrote about your bereavement experience? [RQ1, 4]
    a. Did you feel comfortable?
    b. Was it cathartic/a relief?
9. How difficult did you find it to write about your bereavement experience? [RQ1, 4]
    a. Emotionally (rq4)
10. How comfortable did you feel expressing your feelings to create the song? [RQ4]
11. How did you feel, creating the song with the system? [RQ1, 2]
12. Do you feel you experienced any difficulties using the system? If so, please describe these difficulties and how they affected you. [RQ2]
13. What did you like about the system? [RQ2]
    a. Can you tell me more? Why do you like this? How does it make you feel?

14. How do you feel the system could be improved? Please explain the reasoning behind any suggestions.

15. Would you use the system again in the future, to help with bereavement or for any other reason? Please include the reason in your answer.

Song Creation 1: Interview

16. How likely are you to listen to the song again in the future, and why?

17. Any Additional Comments?

Probe Examples

Detail oriented probes: when did that happen? Who else was involved? Where were you during that time?

Elaboration Probes: Could you tell me more about that? Why exactly do you feel that way?

Clarification probes: You said the program is a success, what do you mean by success?

Silent probes: being quiet and waiting…

Uh-huh probe: encouraging participant to continue by making affirmative but neutral comments like "uh huh" or "I see".

Echo Probe: Repeating the last thing the participant said and asking them to continue. Especially good when a process or event is being described. "I see. So first you pick up your mail. Then what do you do?"

Codebook

Theme, subtheme	**Description**	**Example Quote**
Support expression	How expression was supported and its outcome	"I kind of had it in my head that it had to rhyme, but when I said that you pointed out that it didn't and that made it a lot easier. I guess just getting into the swing of things. The fact that they kind of shuffle through a lot of suggestions was really helpful and I could just keep refreshing it and it wasn't showing the same ones again which was kind of nice."
Support engagement with grief and bereavement	How engagement with grief and bereavement was supported and its outcome	"…I don't think I would of done it without this if you know what I mean. It wouldn't have crossed my mind to do it, not that I wouldn't have done it, it just wouldn't have occurred to me to do something like this to help but I think it has helped because I think it is…or at least I find it good to think back and remember the good times and to try and kind of express the feelings of loss about them no longer being here because that is hard to come to terms with that you're not going to create new memories with them again."
Reframe engagement with grief and bereavement	How engagement with grief and bereavement was reframed and its outcome	"Yeah, because obviously I was trying to make this song a little bit happy and silly and that sort of stuff. I wasn't really focussing on the fact that she is gone, and she is lost. I

		mean the last line of the song is a little bit sad, it is like I miss you, but it is still not sad. If that makes sense."
Receptiveness to ALYSIA	Participant's reactions to the use of ALYSIA	"I think it would be quite fun to be honest. I think it would be a really good outlet for someone because if you are struggling to think of things or to make sense of something it is something to focus on that you can build up."
Other applications for ALYSIA	Other areas participants believed ALYSIA could be useful in	"…I think it would be a great thing for kids to actually channel things for them, I think it would be really instructive for them."
Suggestions for the improvement of ALYSIA	Ways participants felt ALYSIA could be improved	"Maybe because the computerised voice…maybe if someone was singing it in a happier way it might not have been as sad to me. The computerised voice, yeah…it was weird. It was weird hearing something that I had written being sung back but yeah, it was nice."